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NOVEMBER 1990
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DISTILLERY THRIVES WITH 1-2-3

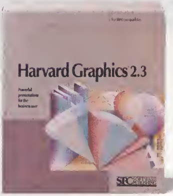
Inside Solver

The Best of the Notebook PCs

Inventory Tracking System

Art Phelan, blending superintendent of Corby Distilleries

[redacted]



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VOLUME 6

LOTUS

NUMBER 11

PERSPECTIVES

IDEAS & TRENDS

Peer-to-Peer LANs 8

Color Printers Are Coming 10

PC Viruses: An Update 12

A New Display Standard 14

SHORTS 18

@LOTUS 20

ESSAY

Stop the Review Hype! 106

APPLICATIONS

The Spririt of @Factory Real-time data and *1-2-3* help a Canadian distillery thrive in an evaporating market. 56

Instant Weekends Arrange seven-day work schedules to give every employee two consecutive days off. 63

Counting the Beans Simultaneously track inventory by units and dollar value... without double-entry accounting. . . . 70

TECHNIQUES

START HERE

Beyond the Worksheet: File Management There's more going on inside your computer than just worksheets. 24

MACRO LETTERS 28

FOR DEVELOPERS

Where Am I? Create models that figure out what release of *1-2-3* or *Symphony* they're in. 30

Life in the Fast Lane How to chart a clear course through a large worksheet. . . 40

45 *By incorporating optimization into a spreadsheet,* 1-2-3/G*'s Solver tells you how best to allocate resources.*

56 *Elmer Cain oversees operations at Corby Distilleries, a beta site for* Lotus @Factory.

Take It to the Limit *1-2-3/G*'s Solver combines optimization and an intuitive graphical interface 45

Q&A 76

GOOD IDEAS 80

HELP/2.2 Feature Facsimiles Squeeze more of the power of Release 3.*x* from 2.2...for free. 84

RESOURCES

REVIEWS

How Much Is Your Business Worth? *Dealmaker*, *Business Valuation Planner* put a dollar value on your firm. . 86

Networks Without Wires When the office sneakernet unravels, consider radio waves. 91

REVIEW OF REVIEWS

Smaller Than a Breadbox A guide to choosing notebook computers. 94

NEW PRODUCTS

AllClear: Create Flow Charts from *1-2-3* Data 98

1-2-3 for the Poqet: A Spreadsheet in the Palm of Your Hand 99

Thinx: A Graphics-Text-Numerical Database 100

New Product Listings 101

IN EVERY ISSUE

Staff Letter 2

Letters 4

Advertiser Index 90

Editorial Evaluation 90

Reader Service Card 90

Cover photography: Dan Heringa

STAFF LETTER

A Tribute to Pioneers

Have you heard the epigram about the sad fate that awaits the first company to introduce or use an innovative product? It goes, "The pioneers are the ones with the arrows in their backs." Fortunately, failure is not always the result of venturing into uncharted territory. Consider Corby Distilleries, the largest producer of whiskeys and other liquors in Canada, and the subject of our cover story this month.

Faced with an "evaporating" market, Corby automated much of its whiskey-blending process by using *1-2-3* and *@Factory,* according to Kelly Conatser, one of the associate editors from our Applications department. As a beta-test site for the just-released add-in for real-time production-line monitoring, Corby's executives took a risk when they signed up to use the software. "Art Phelan, the blending superintendent, was not a programmer," Kelly explains, nor was there extensive computer expertise within Corby. "He was just a guy in search of a solution." Turn to page 56 to learn how he found it.

Essentially, everyone who reads *LOTUS* is in search of solutions. Case studies such as the Corby piece are an important part of our effort to be your "user group in print." Our case studies are not designed to promote any particular Lotus Development Corp. product or even products by other vendors. They're an attempt to showcase strategic and tactical applications of technology.

ANN M MARCUS

The *LOTUS* Applications team: Conatser, Cranford, and Paul

We are proud of the team that prepares our case studies and other Applications articles. Kelly came to *LOTUS* last year after receiving a bachelor's degree in economics from Harvard University and with prior experience as a market analyst for a real estate developer. His colleague Richard Cranford is our senior model writer and editor—he has been affiliated with *LOTUS* since 1986—and also has business experience with *1-2-3*, having worked for the Harvard Community Health Plan. Led by Senior Editor Fredric Paul, a journalist with experience at industry publications such as *CommunicationsWeek, PC Magazine,* and *PC Computing*, we have assembled a team ready to provide the kind of information you can use.

Larry Marion
Editor-in-Chief

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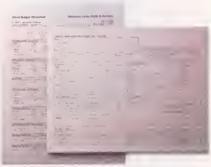

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LETTERS

LESS THAN OPTIMAL

"The Guns-and-Butter Equation" (July, page 78) about linear programming add-ins presented a profit maximization example involving a search for the highest yielding combination of sofas and love seats. The *What'sBest!* package calculated that a combination of 60 love seats and 43 sofas yielded the highest profit, $17,600.

However, a combination of 59 love seats and 44 sofas would yield a total profit of $17,650.

Dennis Hardison
Littleton, Colo.

The editor replies: Several readers spotted the error and the correct answer. The error results from a weakness of *What'sBest!*

The package does not allow users to specify the number of decimal places in a maximum or minimum solution. Instead, it calculates the response to as many decimal places as necessary. *What'sBest!* recommended 60 love seats and 43.33333... sofas, for a maximum profit of $17,666.6064, a correct but useless answer Furthermore, using the @ROUND function of *1-2-3* is not reliable because it would round upward and present an impossible solution. The *What's-Best!* manual half encourages rounding, advising that "while rounding does not always give the optimal answer...in most situations it is good enough..." The review author took the manual's advice and produced the incorrect answer.

CORPORATE PARANOIA VS. EASE OF USE

Two articles in the August issue provide an interesting contrast. "Lotus Sues Borland; Wins its Paperback Suit" (page 14) recounts the lengths to which Lotus Development Corp. will go to preserve the "look and feel" of its spreadsheet products. And "Opportunity Lost" (page 88) states that consumers will suffer because of the failure of the industry to adopt a uniform standard for fonts.

The failure of the industry to come to terms stems from the litigious attitude of the industry. Is the user interface and rendering technology of a printer font any less proprietary than the user interface and internal workings of a spreadsheet program? I think not.

Restriction of "look alike" competition reduces the availability of benefits. The corporate paranoia that supports such protectionism also increases the spread of more-complex copy-protection schemes. The industry should compete on the basis of real values, such as processing speed, efficient use of memory, accuracy, or added features.

Carl E. Hickman
Water Systems Technical Service
Cave Creek, Ariz.

SOFTWARE LICENSING STILL A BURNING ISSUE

"Software Licenses Under Fire" (June, page 9) shows that software licenses can certainly be confusing and open to individual interpretation.

Personally, I ignore the letter of all

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Letters. We welcome letters for publication. If you want your letter considered for publication, send it to the editor If your letter concerns one of our macro-oriented columns, send or E-mail it to Nicholas Delonas, macros editor.

Q&A and Good Ideas. Send submissions to Carrie Thomas, technical editor

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Models published since 1988 are available in the *LOTUS* library, part of the LDC Spreadsheets Forum (GO LOTUSMAG) on CompuServe For more information about *LOTUS* on line, call CompuServe, 1-800-848-8199, and ask for representative 146, if outside the U.S. and Canada, call 1-614-457-0802. For information on how to download *LOTUS* models from CompuServe, see page 80 of the January 1990 issue The models are also on Lotus CD/Prompt.

Abstracts of selected *LOTUS* articles can be found through Dialog Information Services (Palo Alto, Calif.) in Microcomputer Index (Learned Information Inc.) and in Business Software Database (Information Sources Inc.).

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ABOUT THIS MAGAZINE

LOTUS is published monthly by Lotus Publishing Corp., a subsidiary of Lotus Development Corp., and is intended to help users of spreadsheet software The editorial content of *LOTUS* is not determined by Lotus Development Corp., and the software reviews and other opinions expressed in *LOTUS* do not necessarily represent the views of the parent corporation.

license agreements and hold to their spirit. I use the software as I wish but won't provide it to anyone else. Vendors who want to further restrict my use of their products lose my business.

Philip Dyer
Marietta, Ga.

I am planning to set up two computers with *1-2-3* Release 2.2. One is for time-consuming tasks, the other for entering data. When I visited the local software store, I found that Release 2.2 cannot be installed on a second machine without deinstalling it from the first. My enthusiasm for the product cooled.

Will Lotus permit dual use of one package in the near future?

Harry Neilson
Clairton, Pa.

Software licenses seem to be written by and for legal experts who have no experience with real-world uses of computers and software.

We bought two dual-disk-drive computers and copies of *1-2-3, Wordstar,* and other software for each machine. The 10 of us who were the most frequent users found that we had to make our own copies of the software because the disks kept with the computers were always corrupted. There is no question we were violating the license agreements and the law, but the product wasn't usable unless we ignored the letter of the law.

Now I have a portable computer with a single floppy-disk drive and RAM disk. Two people use this computer, yet I found 20 usable systems disks, three different configurations of one spreadsheet package, two different configurations of another spreadsheet package, along with single copies of database, CAD, accounting, and other programs. While none of this software is used in another computer, I am probably violating copyright and licensing agreements. But with two people using the same computer, this is the only way to properly use the machine.

There needs to be a better definition of sites. A site can be a group of people, a group of job descriptions, a family, a room, a group of rooms, a building, a company, a computer, etc. A site with 20 copies of a program running all day should pay more than a site with 20 copies used infrequently.

Keith Schaefer
Nassau, N.Y.

The editor replies: We received dozens of letters, electronic-mail messages, and other communications from readers around the world who wanted to tell us what they thought of the software licensing dilemma. Here is the latest explanation of the Lotus Development Corp. policy:

"Lotus's license agreement allows the licensee to install Lotus software on one computer and make a backup copy for archival purposes. The licensee may move the software from one computer to another provided that the software is deinstalled from the first machine. If a customer wants the convenience of having the software installed on more than one machine, then the customer must buy a licensed copy for each installation. The license does not allow simultaneous installation of the software on more than one computer."

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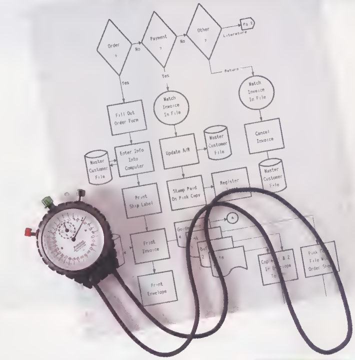

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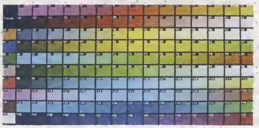

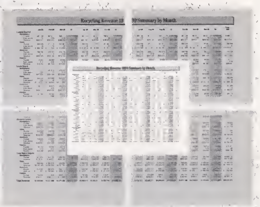
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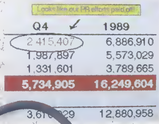
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Q4 ✓	1989
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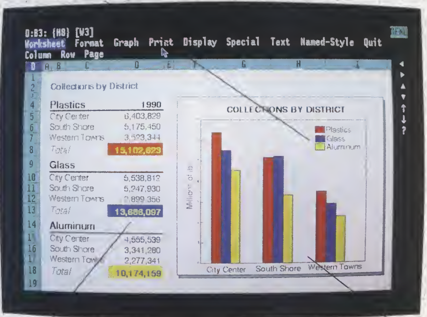
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Worksheet Format Graph Print Display Special Text Named-Style Quit

Column Row Page

Collections by District

Plastics	1990
City Center	6,403,829
South Shore	5,175,450
Western Towns	3,523,344
Total	15,102,623
Glass	
City Center	5,538,812
South Shore	5,247,930
Western Towns	2,899 356
Total	13,688,097
Aluminum	
City Center	4,555,539
South Shore	3,341,280
Western Towns	2,277,341
Total	10,174,159

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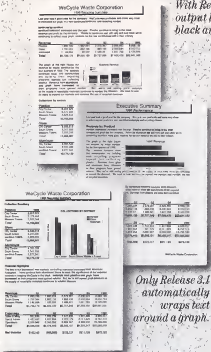

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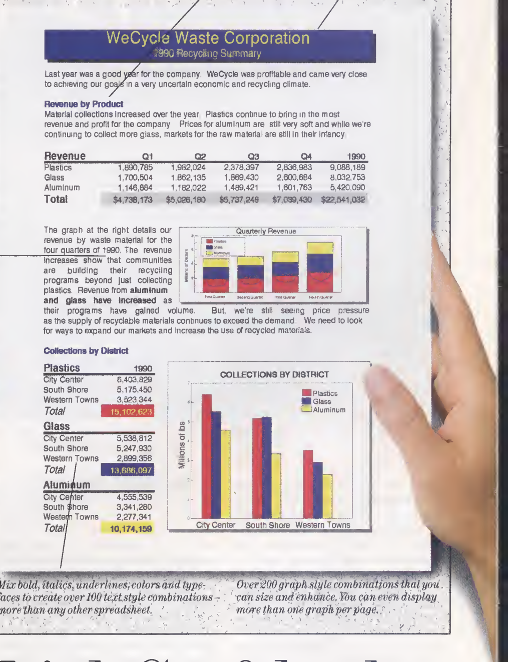

WeCycle Waste Corporation
1990 Recycling Summary

Last year was a good year for the company. WeCycle was profitable and came very close to achieving our goals in a very uncertain economic and recycling climate.

Revenue by Product

Material collections increased over the year. Plastics continue to bring in the most revenue and profit for the company. Prices for aluminum are still very soft and while we're continuing to collect more glass, markets for the raw material are still in their infancy.

Revenue	Q1	Q2	Q3	Q4	1990
Plastics	1,890,785	1,982,024	2,378,397	2,836,983	9,088,189
Glass	1,700,504	1,862,135	1,869,430	2,600,684	8,032,753
Aluminum	1,146,884	1,182,022	1,489,421	1,601,763	5,420,090
Total	$4,738,173	$5,026,180	$5,737,248	$7,039,430	$22,541,032

The graph at the right details our revenue by waste material for the four quarters of 1990. The revenue increases show that communities are building their recycling programs beyond just collecting plastics. Revenue from **aluminum and glass have increased** as their programs have gained volume. But, we're still seeing price pressure as the supply of recyclable materials continues to exceed the demand. We need to look for ways to expand our markets and increase the use of recycled materials.

Collections by District

Plastics	1990
City Center	6,403,829
South Shore	5,175,450
Western Towns	3,523,344
Total	15,102,623

Glass	
City Center	5,538,812
South Shore	5,247,930
Western Towns	2,899,356
Total	13,686,097

Aluminum	
City Center	4,555,539
South Shore	3,341,280
Western Towns	2,277,341
Total	**10,174,159**

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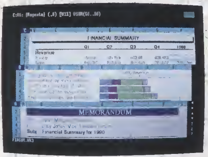

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Networking on the Cheap

Peer-to-peer LANs offer nearly the capability of the better-known alternatives at nowhere near the cost.

Jonathan Krasner and James DeRocher's restaurant delivery service was suffering growing pains. Each new PC that they added forced Takeout Taxi's employees to perform increasingly complicated electronic gymnastics to share data and printers. With the fourth computer, the partners called a halt to swapping floppies and DeRocher went shopping for a local area network.

He was in for a shock. Many of the LANs DeRocher looked at required a mortgage to buy and an engineering degree to operate. For the Herndon, Va., company, installing a high-end LAN would be like using filet mignon to make meatloaf. "We just needed to send a few files back and forth and share a couple of printers," says Krasner.

Then they discovered Net/30, from Invisible Software, of Foster City, Calif.–an easy-to-use, low-cost LAN that gave Takeout Taxi just the features it needed. "For what we're doing," says Krasner, "this thing is great."

Net/30 is one of the new breed of LAN known as peer-to-peer networks. Although market research firms aren't tracking peer-to-peer PC products separately, they estimate that by 1992 more than half of America's PCs will be connected to some kind of network.

For many businesses, peer-to-peer LANs may be the best choice. They are, for the most part, less expensive, easier to install and use, and more flexible than full-featured LANs, such as those from industry leaders Novell and 3Com Corp. These high-end LANs require a separate operating system and at least one dedicated file server–a computer devoted exclusively to warehousing the shared data and applications. And they are often so complex that buyers must attend training sessions, purchase service contracts, and hire a network administrator to act as the LAN's traffic cop.

No fuss, no muss. In a peer-to-peer PC network, by contrast, every computer can function as both a server and a workstation. This flexible arrangement may be a more efficient use of resources for some companies. For example, a system manager could reconfigure a network into clusters of servers, each set up for a work group or department sharing the same applications and data files. And at $200 to $400 per connection for the software and the network cards, a peer-to-peer PC LAN costs one-half to one-tenth the price of a full-featured LAN. It's also easier to install and operate. Some do-it-yourselfers claim that they installed a peer-to-peer network in one afternoon.

PEER-TO-PEER NETWORKS ARE SOME COMPANIES' BEST-KEPT SECRET.

Fred Wilson used Grapevine, a peer-to-peer network from Grapevine LAN Products of Redmond, Wash., to connect eight PCs in his New York venture capital firm, Euclid Partners. "Anyone who is facile enough to write a Lotus macro could install this network and configure it," he says.

Wilson would get no argument from Laurent Ginestiere, the financial expert at Crestmont Fabrics, a Manhattan producer of home-furnishing textiles. Crestmont has seven employees, three outside sales representatives, and annual sales of about $7 million. Ginestiere installed the Grapevine network to connect the firm's four PCs, three printers, and tape backup drive. "You don't have to know anything to use it," he says.

Ginestiere configured the system so that all four PCs can access any printer, any disk drive, and the backup drive. All the computers double as file servers: *1-2-3* is installed on one machine, *MultiMate* is installed on another, and the firm's accounting program, *The Platinum Series*, resides on the most powerful computer, an 80386. "It would be inefficient to use the '386 as a server only," says Ginestiere.

Most manufacturers of peer-to-peer networks aim their products at small businesses like Takeout Taxi and Crestmont Fabrics. But some manufacturers are also acquiring corporate clients–frequently through the back door. Peer-to-peer systems are inexpensive enough that managers of large corporations can and do buy them out of petty cash rather than wait for the corporate bureaucracy. "It's their best-kept secret," says Joseph T. Consalvi, vice president of Grapevine. (And they mean to keep it that way: No manager contacted by *LOTUS* was willing to go on record to discuss such a departure from corporate policy.)

Most peer-to-peer products can accommodate fairly large networks. For example, Alan B. Konkal used LANtastic, a peer-to-peer network from Artisoft of Tucson, Ariz., to connect 42 computers in two buildings at the Naval Underwater Systems Center, a government engineering facility in West Palm Beach, Fla.

Good performance. "We chose a peer-to-peer network mainly because the administration is easy, and we can add

A peer-to-peer network helps Takeout Taxi partners (L to R) Jonathan Krasner, Ron Fox, Kevin Abt, and Jim DeRocher manage their growing restaurant delivery service.

shared resources at a moment's notice," says Konkal. However, the network uses several servers to store applications, including a network version of *1-2-3*. Most data files reside on individual workstations, and the few large files on the servers, says Konkal, are shared "without perceivable performance degradation."

Grapevine claims that its system can accommodate 250 users, but experts say that the real number is much smaller. "Inexpensive, PC-based peer-to-peer systems are not well suited for heavy transaction processing," says Pat Adams, a *dBase* consultant in Brooklyn who uses Invisible Software's Net/30 to connect her three computers.

If you're in the market for a peer-to-peer PC network, the best advice is to shop carefully. They vary greatly in their capabilities, memory consumption, and speed of data exchange. All of them allow you to transfer files and share peripherals, and most of them offer some form of electronic mail. Some of them let you load and operate applications located on a neighbor's computer, but others balk at running software that comes from a different disk.

"I was enthusiastic about these networks at first, but now my feeling is pretty negative," says Witt T. Sparks, a former salesman at Loveland Computer Center, in Loveland, Colo. Sparks installed ReadyNet, from Corvus Systems of San Jose, Calif., in several offices. In one instance, the network consumed so much memory that there wasn't enough left for the application software to load its expanded-memory driver, rendering it useless.

No mainframe links. What you won't get on PC-based peer-to-peer systems are features such as audit trails and links to mainframes and to other networks, which are standard equipment on high-end LANs. Peer-to-peer LANs "can't deliver the interconnectivity, upper-level gateway functionality, and multitier connectivity of a high-end LAN," says Doug Gold, director of communications research for International Data Corp., a market research firm in Framingham, Mass.

One of the reasons LANtastic appealed to the Naval Center's Konkal, in fact, was that he could use Ethernet cards instead of the proprietary hardware required by some peer-to-peer systems. "I wanted to make sure the network boards were compatible with higher-level LANs," he explains. "That way we could upgrade to Novell or 3Com simply by changing the software, without losing any of our hardware investment."

But so far, the LANtastic system has served gracefully. "We haven't reached the point yet where LANtastic is a bottleneck," says Konkal.

Krasner, whose business now has seven PCs and $2.5 million in annual sales, says he hopes Takeout Taxi never outgrows its peer-to-peer network. He has a strong fear of any network that relies on a central file server. "Never, never, never," he insists. "Somebody would kick the power off by accident one day and bring the business to its knees."

—Andrew Maykuth

COLOR PRINTER PRICES DROP

Now, even small work groups can afford to buy one.

When it comes to color and computing, what you see is *not* necessarily what you get. While most of our PC screens display color, our printed pages are strictly black and white. That's mainly because high-quality color printers have been both too expensive and too impractical for general business use.

But color printers are now beginning to move beyond graphic-arts houses and computer-aided design shops into the mainstream of American business. The move has been triggered by a trio of "P" factors: price, presentations, and PostScript. Specifically, lower printer prices, higher expectations for business presentations, and the emergence of the PostScript page-description language as the standard in color printing have added new hues to office output.

Color PostScript printers still aren't cheap, but their prices have dropped below $10,000 and are tumbling toward $5,000, making it feasible for even small work groups to buy and share a unit, either on a network or at a common workstation. Among the more aggressively priced new entries are Seiko Instruments USA's ColorPoint PS ($6,999), Tektronix's Phaser PX ($7,995), and Panasonic Industrial's EPL-8543 ($8,495 with optional PostScript interpreter).

In many cases you now get more for your money, too. QMS, one of the first printer manufacturers to offer a color PostScript model for under $10,000, recently upgraded its popular ColorScript 100 Model 10 ($9,995) to include 8 megabytes of memory, support for legal-size paper, and several other features that used to cost another $2,000–and still do on some competing models.

There are even cheaper color printers, of course. Many dot-matrix printers have long offered color capabilities by using a special ribbon, for example, but their output is poor to fair at best. Color ink-jet printers such as Hewlett-Packard's HP PaintJet, Tektronix's ColorQuick, and Sharp Electronic Corp.'s JX-730 do a much better job, but even their pages at 180 to 216 dots per inch, pale beside the rich, glossy images from 300 dpi thermal-transfer printers like the ColorScript and Phaser PX. And color is one feature on which many people won't compromise. "People are bombarded by high-quality color images every day, and they are unwilling to accept anything less from a color printer," observes Rob Stewart, marketing manager for Tektronix's graphics printing and imaging division.

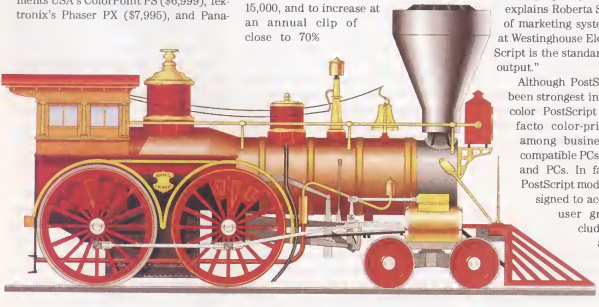
Indeed, the numbers prove as much. Sales of color PostScript printers are expected to double by 1991, from 7,200 this year to 15,000, and to increase at an annual clip of close to 70% thereafter, according to BIS CAP International, a market research firm based in Norwell, Mass. These are modest numbers compared with the hundreds of thousands of black-and-white PostScript printers sold each year, but they indicate that before long, every office–though not every desktop–will have a high-quality color printer. "It's a gradual process, but it's happening," says Greg Porell, director of the color hard-copy service at BIS CAP International.

The desire for slick, vibrant business presentations is stimulating the appetite for color. With laser-quality pages and overhead transparencies now commonplace, color has become the distinguishing feature of presentation visuals. For many businesses, that fact, combined with color's effectiveness, justifies the purchase of a color printer.

Westinghouse Electric Corp.'s consulting unit, near Pittsburgh, gives lots of presentations to both internal and external groups, so they need lots of color visuals. Company officials were impressed with the output of the QMS ColorScript, and the price seemed reasonable, especially since overheads were costing the firm $25 to $50 apiece. But the deciding factor was PostScript, which was already being used for black-and-white output on the office's AppleTalk Network System.

"We do a lot of presentations here, so high-quality color is a must," explains Roberta Smith, a manager of marketing systems and services at Westinghouse Electric. "And PostScript is the standard in high-quality output."

Although PostScript has always been strongest in the Mac market, color PostScript is now the de facto color-printing standard among businesses with IBM-compatible PCs or a mix of Macs and PCs. In fact, newer color PostScript models have been designed to accommodate both user groups. Most include parallel, serial, and AppleTalk ports to make connections easier. The Phaser PX even switches among the



This image was created in *Corel Draw!* and printed on a ColorPoint PS PostScript-compatible printer from Seiko Instruments USA.

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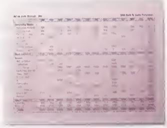

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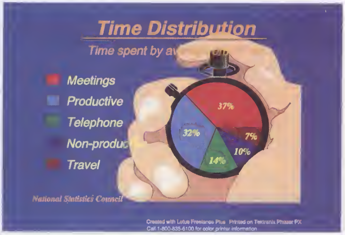


Good color is becoming more important for business-presentation visuals, such as this one, which was created in *Lotus Freelance Plus* and printed on Tektronix's Phaser PX color thermal-transfer printer.

three automatically for simple sharing setups. Many units also provide HP-plotter (HP-GL) emulation for software that doesn't support color PostScript. But since *Microsoft Windows* 3.0 and many of the leading business-graphics and desktop-publishing programs now support color PostScript, that type of mediation is less needed.

Analysts at Chase Manhattan Bank in New York are among the growing ranks of PC users who have adopted a color PostScript printer. Using *Lotus Freelance Plus* and Xerox *Ventura Publisher* on Compaq '386 machines connected to a shared ColorScript, they produce a variety of colorful charts and graphs, including flow charts and organizational trees. The group used to produce the materials on a color plotter but found that a thermal-transfer printer like the ColorScript yields cleaner and brighter images. Managers apparently think so, too. "They notice the difference–no question about it," says Jason Fisher, an analyst with the bank.

There are still some drawbacks, however. The saturated, glossy look requires specially coated paper. That turns off many businesspeople, who want the colors–not the paper–to stand out in a report. That same coated paper also helps keep costs fairly high, typically 50 to 75 cents per color page.

Moreover, many businesses cannot reproduce the pages produced on color printers. Color copiers are relatively new and still very expensive. Canon USA's Color Laser Copier 500 costs $49,000, for example. But as color printers become more widely used, color copier prices will surely drop. And Canon recently introduced a PostScript interpreter for its color copier, enabling computer users to connect directly to the copier for output.

Still, it's the cost of the printer that seems to hold the most sway with potential buyers. When presentations are only occasionally needed or when budgets are tight, say most observers, a lower price is the only thing that will convince an undecided buyer to opt for color over black and white. "Quality is not as important an issue at this point," insists Hali Tanner, a senior market analyst with QMS. "Price and expected frequency of use are the big issues."

Coloring the business world can present some problems, as well. When first given access to an immense color palette, many people so embellish their presentation visuals that they obscure their message. "Getting people to use color, and use it well, is the challenge," notes Tektronix's Stewart. "Most people are not graphic artists or interior designers. They've never been trained in the use of color."

But practice helps. And with color printers finally coming into their own, more and more businesspeople might be trying their hand at coloring.

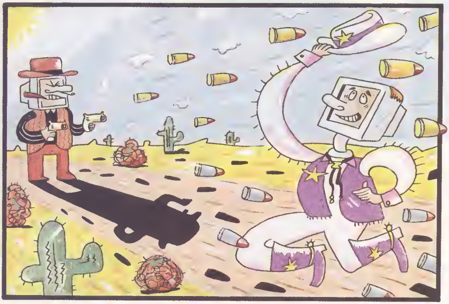
–Christopher O'Malley

DODGING VIRUSES AND OTHER DATA PERILS

User awareness and a few good policies are key, say managers.

At Coca-Cola Foods in Houston, Cheryl Currid and her team walk an electronic beat. They are the LAN police. To minimize the risk of virus infection, Coca-Cola employees are forbidden to store executable programs on the company's local area network. Currid, the director of applied-information technology, enforces the policy by periodically scanning all user-accessible areas on the network and removing any COM, EXE, or BAT files she finds.

"You can easily find out who put a


M E COHEN

particular file on the LAN," says Currid. "If we find that someone has put an executable program on the network, we have a little chat with him and his boss."

Manufacturers Hanover Trust in New York takes a slightly different approach to maintaining a virus-free workplace. "We keep our programs on file servers, in read-only form" says Stephen Morse, senior technical officer. "If a user runs a virus-infected program, the virus won't be able to write to any executable code. This isn't a foolproof defense, however."

Only part of the picture. Every savvy microcomputer and data-processing manager is concerned about viruses and other data invasions. But most managers see viruses as merely one aspect of a much larger issue: computer and data security. "Viruses are a serious threat," says Craig Lamb, a microcomputer manager at Dow Jones & Co. in Princeton, N.J., "but so are hard-disk crashes, power failures, fires, floods, air pollution, software bugs, and

DATA SECURITY: A FEDERAL FEUD

A federal standard for computer security was expected by early fall from the National Institute of Standards and Technology (NIST), an agency of the Commerce Department. NIST planned to propose a system known as public-key cryptography for ensuring the integrity of documents sent over computer networks.

However, the NIST project has been "temporarily shelved," according to Shirley Radack, NIST's group leader for program coordination and support, because of opposition from the National Security Agency (NSA).

Beyond citing "national security issues," neither organization will say why the NSA objects to the proposed computer-security standard. From Radack's perspective, providing a defense against computer snoops and vandals is one way to further the government's aim of "encouraging as much work as possible to take place on networks." Of course, a public-key cryptography system would also prevent intrusions by the NSA. *—Jennifer Smith*

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hardware malfunctions."

In some ways, the plague of computer viruses and the attendant publicity have done managers a favor by bringing the larger issue into focus. For example, with top management alerted to the problem of viruses, micro managers are finding it easier to hire security specialists. Security specialists themselves have learned to capitalize on fear of viruses. "I use *virus* as a buzzword to get people interested," explains Brian Murray, director of corporate information security at Johnson & Johnson in Raritan, N.J. A presentation called "How to Protect Your Data from Viruses," for example, draws far more people than one called "Computer Security in the 1990s," he says.

Most of the policies and procedures micro managers establish to deal with viruses and other threats have several points in common. The most important is an intense focus on what gets into a system and where it comes from. "There's really no secret to preventive measures," says Sandro Cuccia, a systems analyst in Du Pont Co.'s Scientific Computing Division in Wilmington, Del. "The basic thing is not to trust any disk you get from anyone." Du Pont strongly recommends that all employees use virus-detection software to check a disk for infection before they use it.

Don't write off shareware. As you might expect, a software virus is particularly troublesome when a local area network is involved. "If a program doesn't come out of a shrink-wrapped package, we run it on a stand-alone computer first," says Coca-Cola's Currid. Unlike many micro managers, however, Currid is not ready to abandon shareware. "Shareware can save a company literally hundreds of thousands of dollars," she says. "You just have to be careful."

A company must tailor its security procedures to fit the way its employees work, advises Rich B. Levin, author of *The Computer Virus Handbook* (Osborne/McGraw-Hill, 1990). "You can't cut all telecommunications links or ban software brought from home," he insists. "You might as well try to forbid gossiping at the office."

Instead, Levin recommends a few intelligent policies. "Go ahead and download a program from a bulletin board; just don't run it," he says. "Scan the code, and if a program looks good, contact the author and ask for a clean copy."

DON'T SHOOT THE MESSENGER

1-2-3, *Microsoft Word*, and *Microsoft Works* are among the programs most frequently–and incorrectly–blamed for infecting a system with a virus, according to John McAfee, founder of the Computer Virus Industry Association and author of *Scan*, an antivirus shareware program available from McAfee Associates (Santa Clara, Calif., 408-988-3832).

The reason is that most viruses do their insidious work by finding an application's executable (EXE) file, determining how long it is, and attaching themselves to its end. What *1-2-3*, *Word*, and *Works* have in common is that in order to minimize the amount of memory required for program execution, they don't ask DOS to load the entire EXE file at once. Instead, they instruct DOS to load just a startup portion, or kernel. The kernel then loads the rest of the file, using a DOS extender (in *1-2-3*) or overlays (in *Word* and *Works*). Viruses don't know that, however, so they end up attaching themselves to the end of the kernel rather than to the end of the EXE file.

This causes *immediate* program failure and makes it look as if *1-2-3*, *Word*, or *Works* transmitted the virus, when in fact, a system could have been infected for some time. *1-2-3*, *Word*, and *Works* simply force the virus into the open.

–A.G.

Crime and punishment. Enforcing security policies is another common concern among micro managers. Networks tend to make enforcement easier by virtue of their centralization. But stand-alone PCs present a more challenging problem. Here, education and organized campaigns to increase user awareness are the main tools of micro managers. "But you have to do it right," says Du Pont's Cuccia. "You don't want to give users the impression that Big Brother is watching."

Like many managers, Cuccia is as concerned about information security as he is about viruses. "People often keep sensitive files and documents on their computers," he says. "It doesn't occur to them that this can be nearly as bad as leaving a document right on the desk."

Johnson & Johnson's Murray agrees: "We have a secure mainframe, but what happens if someone downloads a sensitive file to a PC, works on it for a while, and then goes to lunch?" he asks. "Any passerby could walk away with formulas, payroll information, and other sensitive data."

In addition to installing software that requires users to enter IDs and passwords, Johnson & Johnson is working to incorporate security awareness into employee orientation. For example, a new manual outlines security guidelines and procedures. Most of them, says Murray, are simple and fairly obvious: Never leave a terminal unattended, put write-protect tabs on your master disks, don't use your birth date or spouse's name as a password, and be alert for computer viruses.

Of course sometimes "virus awareness" gets a bit out of hand. Several micro managers report receiving virus alerts from users with very ordinary hardware or software problems. "Anytime something goes wrong, it gets blamed on a virus," says one manager. "I guess that means we're doing our job."

–Alfred Glossbrenner

……

The New VGA

Edsun Labs' new chip set delivers sharper, more colorful, less costly graphics.

In less than four years, IBM's Video Graphics Array (VGA) standard has established itself as the most popular option for PC graphics. According to market researcher Dataquest (San Jose, Calif.), 78% of all video boards sold in 1989 conform to the VGA standard. However, some intriguing enhancements that are likely to threaten the VGA status quo are about to appear.

One of the most exciting developments is a chip engineered by Edsun Laboratories of Waltham, Mass. This VGA chip replacement, dubbed Continuous Edge

Graphics Digital to Analog Converter (CEG/DAC), replaces part of the circuitry on a VGA board, specifically the digital-to-analog signal chip. CEG greatly improves resolution and explodes the number of available colors from VGA's standard 256-hue palette to a dazzling 740,000.

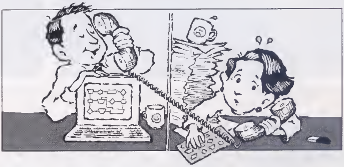
Some sophisticated video boards can match CEG's near-photographic quality, but they can't match its low cost. Upscale graphics subsystems, such as the 8514/A from IBM, can require premium-priced monitors and cost $3,000 or more. Edsun's chip will cost vendors $30 to $50 each in quantities of 1,000 and work with reasonably priced VGA monitors, according to Steve Edelson, Edsun's chairman and CEO. Ultimately, the technology probably won't add more than $100 to the retail cost of a VGA setup, estimates Tim Bajarin, executive vice president of the research firm Creative Strategies Research International (Santa Clara, Calif.).

Fooling the eye. Edsun's patented CEG technology uses a technique called anti-aliasing, which gives drawings and type fonts an apparent resolution of 1,536 by 1,280 pixels. Anti-aliasing lets each pixel display two colors at once, giving the illusion of smoother lines (particularly noticeable in diagonals and curves) than VGA resolutions. CEG gives personal computers workstation-class graphics, says Bajarin, who calls it "one of the most important hardware ideas on the market."

Obviously, not everyone needs CEG. People who don't use graphics probably won't see much difference. And in some cases, certain types of fine-line drawings may actually look fuzzier with the Edsun chip, says Gary Null, manager of advertising and communications for Monolithic Systems Corp. (Englewood, Colo.), the first vendor to announce a CEG-equipped board. Monolithic's board comes with 1 megabyte of video RAM and costs $895, $300 more than the company's comparably equipped VGA board.

Vendors have pushed the limits of IBM's original VGA color and resolution practically since its introduction. While consumers have benefited, they must also now deal with a confusing array of mutually incompatible proprietary approaches. Each "better-than-VGA" operating mode, including CEG, Super VGA, and IBM's 8514/A standard, requires a separate driver for each application. In fact,

Word is getting around.



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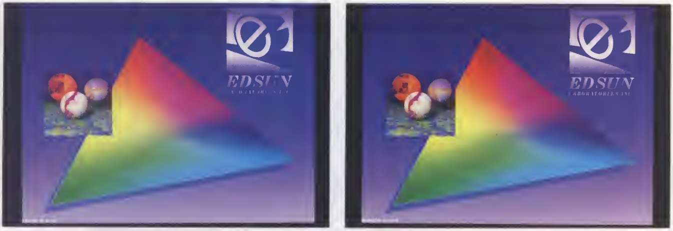
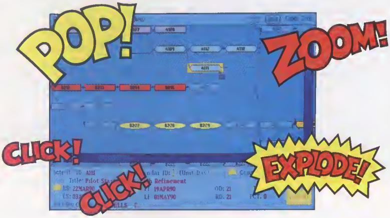


A standard VGA image (left) is limited to 256 colors. At right the same image displayed with Edsun Labs' CEG technology shows greater resolution and edge definition.

better graphics performance has been delayed more by board makers and software developers than by the capabilities of the hardware itself.

To date, CEG drivers are available only for *1-2-3* Releases 2/2.01 and *AutoCAD*, but a *Microsoft Windows* 3.0 driver is expected before yearend, as are drivers for later releases of *1-2-3*. In the meantime, you can use your applications at their normal resolutions, because the Edsun chip set works with standard VGA modes.



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A Super-VGA standard. In 1988 in an effort to curtail this rampant incompatibility, a group of leading graphics-components manufacturers formed the Video Electronic Standards Association (VESA). The group, which includes such graphics heavyweights as NEC Corp., Hewlett-Packard Co., Intel Corp., Chips and Technologies, Tseng Laboratories, Western Digital Imaging (formerly Paradise Systems), and Headland Technology (manufacturer of Video Seven products), recently established standards for Super VGA.

The VESA standards translate into a set of rules for applications to use when working with graphics modes that exceed the original VGA specifications (see the "Beyond VGA" box). For those who already own Super VGA-type boards, many board vendors say they plan to provide terminate-and-stay-resident software to make their boards' Super VGA modes VESA-compliant.

However, even as vendors are getting together on Super VGA, IBM is said to be introducing yet another advanced graphics standard. The company has made no announcement, but several industry observers, including Joan-Carol Brigham, an analyst with the research firm International Data Corp., report that IBM plans to ship some of its higher-priced motherboards with new technology called XGA (for Extended Graphics Adapter). XGA improves on the 8514/A standard by displaying more colors and by offering 1,024-by-768-pixel resolution in noninterlaced mode, which cuts down on screen flicker. (In noninterlaced mode,

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BEYOND VGA

Standard	Resolution (Pixels)	Number of Colors
VGA	320 X 200	256
	640 X 480	16
Super VGA	640 X 480	256
	800 X 600	256
	1,024 X 768	256
	1,280 X 1,024	256
8514/A	1,024 X 768	256
XGA	1,024 X 768	256
	1,280 X 1,024	256
CEG	640 X 480	742,813
	800 X 600*	742,813
	1,024 X 768*	742,813
	1,280 X 1,024*	742,813

* Actual resolutions higher than 640 by 480 pixels are achieved by adding CEG to a Super VGA board; however, Edsun Laboratories says CEG will provide an apparent resolution of 1,536 by 1,280 pixels when added to a standard VGA board. To view resolutions higher than 640 by 480 pixels, you need a multiple-scan-rate monitor, a trade-up that typically adds $200 to $400 to the cost of a graphics subsystem.

the monitor scans every line in a single pass. In interlaced mode, the monitor scans every second line in the first pass and fills in the remaining lines in the next.)

What's next? One thing's for certain: Plain vanilla VGA is heading for the bargain basement. For example, ATI Technologies (Scarborough, Ontario), a major manufacturer of graphics boards, recently announced a VGA adapter with a list price of $99.

The jury's still out on which graphics standard will eventually succeed VGA. So far, neither the Super VGA that VESA proposes nor any of several proprietary graphics schemes has had much of an impact on the mass market. In a recent survey of 500 organizations by International Data Corp., only about 4% of the respondents said that they used a graphics standard higher than VGA. The situation is unlikely to change much, says IDC analyst Brigham, until advanced graphics solutions reach the "magic" price point of $500 for an adapter and monitor.

Until then, advises Creative Strategies' Bajarin, "watch what IBM puts on the motherboard. After all, that's how VGA got started." *—Richard Dalton*

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CIRCLE 105 ON READER SERVICE CARD

Brite Lite, Research Development Innovations' new laptop computer, runs Unix, DOS, and Mac applications at up to 13 mips.

A Multilingual Laptop

Watch for Research Development Innovations, a small San Diego startup, to unveil an 8½-pound laptop computer with some very big features this month at Comdex/Fall '90, the personal-computer trade show. RDI claims that Brite Lite, its battery-operated laptop, can run Unix, Macintosh, and DOS applications at up to 13 million instructions per second.

The zippy, 20-MHz microprocessor from chipmaker LSI Logic Corp. runs DOS and Mac applications as software emulations. Even as emulations, claims RDI president Rick Schrameck, DOS applications run faster than they do on a PC AT, and Mac applications run faster than on a Mac SE. If that's still too slow, RDI offers a pair of coprocessors to boost emulation speeds even more.

Brite Lite's proprietary screen technology offers workstation-class, 1,152-by-900-pixel resolution on the 11¼-inch liquid-crystal display. RDI and a Japanese partner have also developed a color LCD, but the screen alone costs nearly $5,000, so Brite Lite will debut with a monochrome display.

With the monochrome screen, 8 megabytes of RAM, a 1.44-megabyte floppy-disk drive, and a 100-megabyte hard-disk drive, Brite Lite will cost about $7,000. Options include a 200-megabyte hard drive and up to 24 additional megabytes of RAM. A 2-hour NiCad battery pack adds about 1½ pounds to the machine's weight. A 4¼-pound, 6-hour battery pack is also available.

—Jennifer Smith

Sign of the Times

If the daily headlines aren't enough to make you nervous, now you can go on-line to download data about troop movements in Saudi Arabia or about nuclear accidents. Mead Data Central recently added a file on the Iraqi crisis to its Nexis on-line database, and Japan's Ministry of International Trade and Industry is maintaining a nuclear energy bulletin board.

The Japanese network, called Atom Net, offers data on world energy supplies, atomic accidents, and other nuclear news. According to *The Teleputing Hotline* newsletter, the network can be accessed free at 81-3-5470-5511, or 03-5470-5511 in Japan.

Nexis's Iraqi file, which includes information culled from 22 news sources and financial services, debuted just as hopes for peace in the Persian Gulf were fading. Nexis spokesperson Michelle Love says the decision to create the new file was driven more by customer demand than by a gloomy political outlook. How long will the file remain in service? "I don't think we're the ones who will make the decision," Love says, explaining that Mead Data Central will keep the Iraqi file open as long as the subject is relevant.

—Tracy Mayor

Laying Down Arms

Mom may have been wrong about the benefits of sunshine and red meat, but doctors and PC specialists are learning how right she was about good posture—especially at the computer. As keyboard-related wrist, neck, and shoulder afflictions increase, makers of PC accessories are intensifying their efforts to market relief.

Three years ago, Lou Valliere had enough of typing with his wrists at the uphill slant that causes the potentially debilitating carpal tunnel syndrome. Valliere designed a flat-topped, styrofoam-filled pillow that let him put his keyboard in his lap and his palms on a rest to keep his wrists straight. This left his arms in a natural position as he typed. The KB-Pillow worked so well that Valliere took his message to the streets, and his company, Ergo-Nomic counts a trio of California newspapers among its clients.

Taking the battle to a higher plane, Flex-Vision sells the Compu-Rest Arm Support, which is designed to shorten recovery time after carpal tunnel surgery. The mechanical arm rests, mounted to the desktop on either side of the keyboard, let users move across the entire keyboard while ensuring that their wrists stay straight and their arms and shoulders aren't unduly pressured. Pamela Lee, owner of the Santa Rosa, Calif., company, says that both individual workers and corporate health and safety departments are buying the arm rests.

If comfort is so easy to obtain, why isn't every keyboard ergonomic? Valliere blames habit for our bad habits: "People think it's not businesslike to be comfortable."

—T.M.

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CIRCLE 106 ON READER SERVICE CARD

Upgrading Made Easy

Lotus Development Corp.'s new in-store upgrade program should make upgrading to *1-2-3* Release 2.2 or 3.1 a lot quicker. Just bring the title page (the original, not a copy) of your current *1-2-3* reference manual to a participating computer specialty store. Participating dealers include Egghead Discount Software, ComputerLand, and Soft Warehouse.

If you bought *1-2-3* Release 3 on or after May 7, 1990, you may upgrade to Release 3.1 for free through December 31, 1990. If you bought Release 3 before May 7, 1990, the upgrade cost is $35. Release 2.2 users may upgrade for $75 through December 31, 1990; users of earlier releases may upgrade for $150.

Of course, you may continue to upgrade directly through Lotus by ordering from the Lotus Selects catalog or by calling 800-TRADEUP for specific upgrade information.

Release 3.1 for the Feds

Lotus Development Corp. has released a government edition of the recently shipped *1-2-3* Release 3.1. Features unique to the special edition include its ability to translate spreadsheet files between *Microsoft Multiplan* 4.2, *Enable* 2.0, and *SuperCalc4*. Although Release 3.1 can print in landscape mode (sideways) on laser printers, the government version comes with Funk Software's *Sideways* add-in, so users can also print wide reports on dot-matrix printers. And the government edition contains a coupon for a free DataLens driver that provides access to information residing on Microsoft SQL Server databases.

Like its standard counterpart, the Release 3.1 government edition requires an IBM PC AT, PS/2, Compaq, or compatible computer with an 80286 or higher microprocessor, a hard disk, 1 megabyte of available RAM, and DOS 3.0 or higher. However, it is available only through Lotus-authorized government resellers, including 800 Software, Egghead Discount Software, Government Technology Services, and Softmart.

The program has a suggested retail price of $595, but any government user who buys *1-2-3* Release 3 on or after May 7, 1990, may upgrade to Release 3.1 free through December 31, 1990. Those who purchased Release 3 before May 7, 1990, may upgrade for $35. Release 2.2 users may upgrade for $75 through December 31, 1990; users of earlier releases may upgrade for $150. For more upgrade information, call 800-343-5414.

Network server and node editions of the government edition will be available in the fourth quarter of 1990 at suggested retail prices of $795 and $495, respectively.

Expanded Memory Problem in Release 2.01

Some users of *1-2-3* Release 2.01 report a problem in the way Release 2.01's database functions and commands operate under expanded memory. The symptom, which seems to occur randomly, is a database command or function that returns anomalous results. The reason is apparently that Release 2.01 sometimes fails to access all the data.

Eric Wolfe, a Los Angeles–based macro programmer, has had trouble running @DSUM functions on three different expanded-memory system configurations. Steven Manus, president of Manusoft Corp., a Pasadena, Calif., developer of accounting software, also noticed the problem. "Entire columns of data would be missing from the matching records in a Data Query Extract," he says.

The surest way to avoid encountering this problem is to upgrade to Release 2.2. "It's definitely fixed in Release 2.2," says Richard Reily, Lotus's senior development manager of product marketing. However, if upgrading isn't on your agenda, you can try to work around the problem. If you suspect incorrect results, save the file to disk, retrieve it, and try the database command or function again. When you retrieve the file, the data is loaded sequentially into memory with all the expanded-memory pointers, and Release 2.01 has a better chance of finding it all.

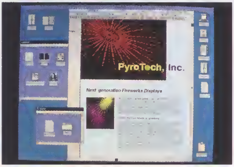
Lotus/Interleaf Technology Partnership

Lotus Development Corp. and Interleaf, a Cambridge, Mass., developer of electronic-publishing software, have combined technologies to link *1-2-3* worksheets and documents in Interleaf's recently announced Interleaf 5 family of electronic-publishing products.

Interleaf 5 uses active-document technology (see "Intelligent Documents Arrive," August, page 6), which allows electronic documents to access, evaluate, and act on information. Once the initial link between *1-2-3* and Interleaf is established—by copying and pasting a spreadsheet icon into an Interleaf document—the document will be dynamically updated whenever the data changes in the linked worksheet.

But beyond the dynamic link, Interleaf will provide a Lotus toolkit that allows programmers to create so-called intelligent links to *1-2-3*. An intelligent link can evaluate the data in a spreadsheet and act on it. For example, when a cell in the Amount Sold column of a sales worksheet exceeds some set value, an intelligent link might be programmed to do the following: Create a new document notifying the vice president of sales that sales are exceeding expectations, extract and display information from the inventory database, enter the information in a tally document, and mail the package to the vice president.

Interleaf 5—and the *1-2-3* link—will ship in December for Unix systems from Apollo Computer, Digital Equipment Corp., Hewlett-Packard, and Sun Microsystems and for the IBM RISC System 6000. Versions for DOS and VMS systems will ship in the spring of 1991, and a Macintosh version in the summer of 1991. The Lotus toolkit will be available in the first quarter of 1991 exclusively to Interleaf staff and value-added resellers.



Users of Interleaf's electronic-publishing software can now create "intelligent" links to *1-2-3* worksheets.

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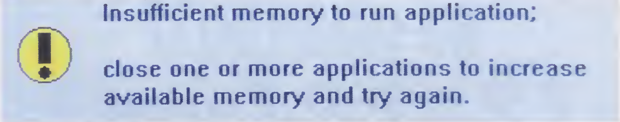
Insufficient memory to run application;

close one or more applications to increase available memory and try again.

When Windows 3.0 says there's not enough room to run your DOS programs, it's just trying to tell you it needs QEMM 5.1.

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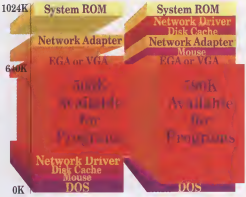

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QEMM-386 System Requirements: 80386-based PCs and PS/2s and PCs with 80386 add-in boards. Operating system: PC DOS 2.0-4.0, MS DOS 2.0-4.0, Windows 3.0 Conventional memory requirement 1.5K.
DESQview System Requirements: IBM Personal Computer and 100% compatibles (with 8086, 8088, 80286, 80386 or i486 processors) with monochrome or color display, IBM Personal System/2 • Memory: 640K recommended; for DESQview itself 0-155K • Expanded Memory (Optional): expanded memory boards compatible with the Intel AboveBoard, enhanced expanded memory boards compatible with the AST RAMpage; EMS 4.0 expanded memory boards • Disk: two diskette drives or one diskette drive and a hard disk • Graphics Card (Optional): Hercules, IBM Color/Graphics (CGA). IBM Enhanced Graphics (EGA), IBM PS/2 Advanced Graphics (VGA) • Mouse (Optional) Mouse Systems, Microsoft and compatibles • Modem for Auto-Dialer (Optional): Hayes or compatible • Operating System: PC-DOS 2.0-4.0; MS-DOS 2.0-4.0 • Software: Most PC-DOS and MS-DOS programs, programs specific to Microsoft Windows 1.03-3.0, GEM 1.1-3.0, IBM TopView 1.1 • Media: DESQview is available on either 5-1/4" or 3-1/2" floppy diskette.
Trademarks: Windows, MS-DOS: Microsoft Corporation; PS/2, Interleaf, TopView: IBM Corporation; 80386, i486, AboveBoard: Intel Corporation; 1-2-3: Lotus Development Corporation, AutoCAD 386: Autodesk, Inc, RAMpage: AST Research; Hercules; Mouse Systems; Hayes; GEM, Digital Research, Inc.

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CIRCLE 107 ON READER SERVICE CARD

1-2-3 for Eastern Europe

In an effort to expand its presence in Eastern Europe, Lotus Development Corp. recently brought out an Eastern European version of *1-2-3* Release 2.2, sponsored its first Eastern European user conference, and named three Eastern European distributors.

1-2-3 Release 2.2 for Eastern Europe gives users an extra 80 characters, such as the diacritical marks of Czech and Slovak and the German umlaut, that aren't in the English character set. More than 330 computer users from Hungary, Romania, Czechoslovakia, and Yugoslavia saw this and other Lotus software at Lotus's first Eastern European user conference, held recently in Budapest.

The number of PCs in Czechoslovakia, Hungary, and Yugoslavia—currently 280,000—is expected to grow to 450,000 over the next six months, estimates Steve Crummey, senior vice president of Lotus's International Business Group. Lotus customers in Eastern Europe will be served by Lotus's new Eastern European distributors: Vupek, which has 13 service and support outlets throughout Czechoslovakia; Novotrade, based in Budapest; and Yusaco, based in Novi Sad, Yugoslavia.

DataLens Tools for Sun and DEC

Lotus recently shipped a pair of DataLens Developer Toolkits: one for the VAX platform and one for Sun workstations. A DataLens Developer Toolkit is a set of programming tools that lets developers build drivers that connect their data sources with *1-2-3.* Using *1-2-3*'s familiar Data External and Data Query commands, users can access and analyze data from any data source for which there is a DataLens driver.

Drivers under development for VAX/VMS include those for products from Sybase, Ingres Corp., and Oracle Corp. Drivers for Sybase, Ingres, Microrim, Oracle, and Unify products are under development for *1-2-3 for Sun.*

The DataLens Developer Toolkit for VAX/VMS requires release 3.0 or later of a VAX C compiler and VAX/VMS 5.2 or later. The DataLens Developer Toolkit for Sun requires a SunOS compiler and SunOS 4.0.3 or later. To use either toolkit you need 4 megabytes of RAM, 5 megabytes of free disk space, and a DataLens-capable application.

Each toolkit costs $250 and includes the DataLens specification, a sample driver, code libraries, diagnostic tools, documentation, and a test application. You also get premium support for six months and a subscription to the *Lotus DataLens Developer Newsletter,* which provides tips and information updates. The driver manufacturers will price, distribute, and support specific drivers. For information on the availability of DataLens drivers or to order a DataLens Developer Toolkit, call Lotus at 800-343-5414. ■

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Worksheet Range Copy Move File Print Graph Data System Add-In Quit
Global Insert Delete Column Erase Titles Window Status Page Learn
  A BC            D            E    F    G    H    I  J  KL
1
2
3
```

```
TuxShipped HatShipped Production SewLabor Ratios Print
                Tip Top Tuxedo Company
 Color
 newStyles
 Sizes      Regular vs. big and tall
 Tailoring
 MainMenu
                               $1,526,456   $1,35
                                 $234,444    $105
 Total Revenue                 $1,760,900   $1,460

 Expenses
   Fabric bolts                              $921
   Hat brims                     $182,353     $63
   Sewing Labor                   $56,098     $56
   Model Agency                   $89,672     $73

 Total Expenses                $1,278,729   $1,106

 Net Income                      $182,171     $351
 F1=HELP  F2=EDIT  F3=LIST  F4=MENU  F5=GOTO  F6=S
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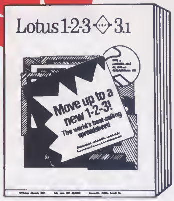

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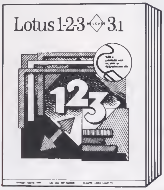

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CIRCLE 109 ON READER SERVICE CARD

Beyond the Worksheet: File Management

There's more inside your computer than just worksheets.

BY DANIEL GASTEIGER

Whenever you run *1-2-3,* you also run another software program: the disk operating system, or DOS. Even though you can get along without ever leaving the spreadsheet, there are at least two reasons why it's worth learning the basics of DOS. First, DOS lets you perform several tasks more quickly than you might from within *1-2-3*. Second, there are certain tasks, such as preparing a disk for use or renaming a file, that you must perform by using DOS.

Over the next few months, this column will explore DOS. We'll start with the basics of file management and examine essential DOS commands, such as COPY, RENAME, and DELETE. (These articles assume that your computer has a hard-disk drive and uses DOS; if you use OS/2, they won't apply to your system.)

DOS AND DISK DRIVES

When you switch on your computer, DOS starts up automatically. It acts as a go-between for the hardware and application software. For example, when *1-2-3* saves a file, it alerts DOS that there is information to save. DOS takes control, saves the file on disk, and then returns control to *1-2-3*.

As long as DOS is in control of your computer and no other programs are running, a DOS prompt appears on the monitor. At its simplest, this prompt is a letter followed by a greater-than sign, such as A> or C>. To follow this discussion, get to a DOS prompt. Exit from *1-2-3,* or restart your computer by holding down the Control and Alt keys and pressing Delete. If a program other than DOS automatically appears when you restart your computer, ask the person who set up your system to help you exit to DOS.

The letter of the DOS prompt indicates which disk drive is "current"—that is, which drive DOS automatically uses when you issue a command. For example, when the C> prompt is visible and you type *dir,* DOS lists files stored on the C drive. (More about DIR, the DOS directory command, in a moment.)

Typically, the A and B drives are floppy-disk drives, and drives C through Z are hard disks. Most computers have an A drive and a C drive. Many have B and D drives, as well. If your computer has only one floppy-disk drive, it serves as both the A and B drives.

To make a drive current, type the drive letter followed by a colon and press Return. For example, to switch from drive C to drive A, first insert a disk that already contains data in drive A and close the drive door. Then type *a:* and press Return. The drive light flickers, and the A> prompt appears.

To switch to the C drive, type *c:* and press Return. If your computer has a C drive, switch to the D drive by typing *d:* and pressing Return. Continue through the alphabet until DOS responds with the message *Invalid Drive Specification.*

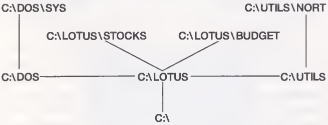
THE DIRECTORY TREE

Like a large file cabinet, a disk can hold thousands of files—so many that finding one particular file would require serious sleuthing if they all were stored in one big batch. Just as you organize and subdivide a file cabinet into sections, you create subdirectories in DOS to simplify file storage and retrieval.

Subdirectories allow you to organize files. For example, while working with *1-2-3,* you may create worksheets that have different uses. Some may analyze stock, project earnings, or estimate department spending. If each type of worksheet resides in its own subdirectory, finding the third-quarter budget, for example, requires only that you browse through the budget worksheets subdirectory.

Each disk has a directory called the root directory. DOS represents the root directory on drive C as C:\, the root directory on drive A as A:\, and so on. Any "directory" that you create on a disk is really a subdirectory of that disk's root directory. On a typical hard disk, one subdirectory of the root may be named \123 or \LOTUS. This directory holds the *1-2-3* program files. In addition, there may be subdirectories of the LOTUS subdirectory for budget files, stock-analysis worksheets, and so on. Alternatively, there might be subdirectories directly off the root for these files.

Because of the way that directories branch from one to many, the directory structure of a disk is called the directory tree. The following figure shows a sample directory tree for a typical C drive.



A subdirectory is identified by its path name. The path name of the root on the C drive is C:\, as it appears at the bottom of the directory tree in the figure. The path name to the LOTUS subdirectory of the root directory is C:\LOTUS. A subdirectory named BUDGET, which branches off the LOTUS subdirectory of the root directory, has the path name C:\LOTUS\BUDGET.

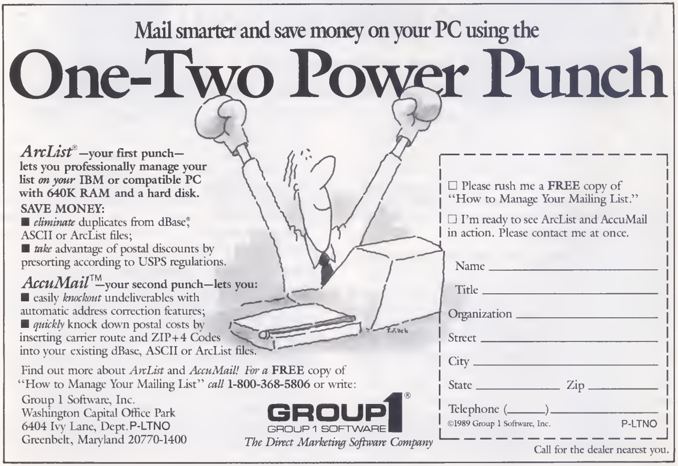
LIST FILES

The command to make a drive current is one of the simplest in DOS. Just switching from one drive to another tells you nothing of the contents of the disks. But DOS has the DIR command, which lists the files and subdirectories in a directory or subdirectory. Type *c:* and press Return to make drive C current. Then enter *dir*.

What appears in the list on your screen depends entirely on the subdirectories and files on your hard disk. The figure below shows a typical output of the DIR command. The directory list identifies the source of the listing and the path name of the list's directory—in this case, C:\. For each file in the list, DOS displays the size in bytes and the date and time that the file was created or last changed. For example, the last item in the list is the file named AUTOEXEC.BAT, which is 110 bytes large and was created on July 17, 1990, at 12:10 P.M. At the bottom of the list, DOS reports the total number of files in the directory and the amount of space remaining on the disk.

In the sample list, subdirectories of the C drive's root appear with the notation <DIR> in place of a file size. Your subdirectories will probably have different names from those listed in the sample. However, the two steps for exploring the subdirectories are the same. First make the subdirectory current and then use the DIR command.

Suppose you have a subdirectory named LOTUS on the C drive. If your C drive lacks a \LOTUS directory, use some other directory's path name when you issue the CD, or change directory, command. The directories of your C drive will be listed in the output from the DIR command.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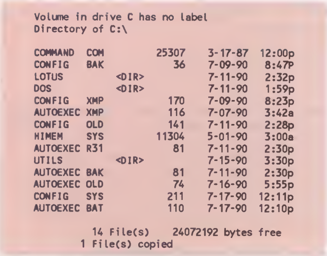
To change to the C:\LOTUS directory, type *cd\lotus* and press Return.

Remember that DOS automatically assumes that the command applies to the current disk. The command CD\LOTUS means, "Change to the subdirectory named \LOTUS on the current disk," which in this case is drive C. Now you can list the contents of whatever directory you've made current by typing *dir* and pressing Return. DOS presents a list of the files in the subdirectory.



```
Volume in drive C has no label
Directory of C:\

COMMAND  COM          25307   3-17-87  12:00p
CONFIG   BAK             36   7-09-90   8:47P
LOTUS        <DIR>            7-11-90   2:32p
DOS          <DIR>            7-11-90   1:59p
CONFIG   XMP            170   7-09-90   8:23p
AUTOEXEC XMP            116   7-07-90   3:42a
CONFIG   OLD            141   7-11-90   2:28p
HIMEM    SYS          11304   5-01-90   3:00a
AUTOEXEC R31             81   7-11-90   2:30p
UTILS        <DIR>            7-15-90   3:30p
AUTOEXEC BAK             81   7-11-90   2:30p
AUTOEXEC OLD             74   7-16-90   5:55p
CONFIG   SYS            211   7-17-90  12:11p
AUTOEXEC BAT            110   7-17-90  12:10p

          14 File(s)   24072192 bytes free
        1 File(s) copied
```

DOS's DIR command shows what's on a disk.

A subdirectory remains current until you issue a new CD command. Even if you make a different disk current–A>, for example–DOS won't forget that LOTUS was the active directory on the C drive. If you issue the C: command, DOS returns you not just to the C drive, but to the \LOTUS subdirectory on that drive. This has particular significance for some of the commands that next month's column will explore. For now, however, return to the C drive's root directory by entering *cd*. Then enter the command that you usually use to start *1-2-3*.

The CD and DIR commands give you the power to prowl through your disks and their directories. Practice using these commands and familiarize yourself with the layout of your directory tree or trees. Next month you'll learn more about the DIR command, explore a strategy for setting up a hard disk's directory tree, and see how easy it is to copy files from disk to disk or from one directory to another. ◼

Daniel Gasteiger is a *1-2-3* and *Symphony* consultant in Boston and a contributing editor to *LOTUS*.

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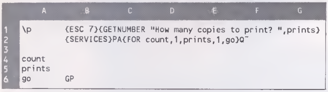
Macro Letters

PRINTING MULTIPLE COPIES

One feature missing from *Symphony* is the ability to set the number of copies to print. Such a powerful program should handle that request. Since it doesn't, I wrote a short macro to set the number of print copies.

To build the macro, enter the labels in the figure:



```
     A         B         C         D         E         F         G
1  \p        {ESC 7}{GETNUMBER "How many copies to print? ",prints}
2            {SERVICES}PA{FOR count,1,prints,1,go}Q~
3
4  count
5  prints
6  go        GP
```

Use the Range Name Labels Right command to assign the labels in column A as range names for the adjacent cells in column B.

You must set all the print settings and have a valid Print range before running the macro. When you're ready to print, hold down the MACRO key (Alt on most computers) and press P.

The macro prompts you for the number of copies to print, then prints as many copies as you designated. Here's how it works:

{ESC 7}{GETNUMBER "How many copies to print?", prints} presses the Escape key seven times to clear the control panel if you were making menu choices, so you can call the print macro from the Print settings menu. If you weren't making menu choices, the Escape key has no effect. The macro asks you how many copies you want to print, then stores your response in the cell named *prints*.

{SERVICES}PA{FOR count,1,prints,1,go}Q selects SERVICES Print Align to align the printer, then starts a FOR loop.

The FOR loop prints as many copies as the value stored in the cell named *prints*. It does this by calling the subroutine *go* that many times. *Go* simply issues the Go command followed by the Page-Advance command. The *go* subroutine generates one copy of your printout each time the FOR loop runs it.

The first argument of the FOR command specifies the cell (*count*) where the FOR loop keeps track of how many times it has run *go*. The second argument specifies the value that the FOR loop should start counting from, and the third argument specifies the value that the FOR loop should count to. The fourth argument tells *Symphony* how much to count by. So, in this case, *Symphony* counts by 1 from 1 to the value stored in *prints* and stores each intermittent result in the *count* cell. When the value in *count* exceeds the value in *prints*, the FOR loop stops. The macro continues by selecting Quit from the Print menu. The macro then updates the screen by pressing the Return key.

David G. Smith
Cross Junction, Va.

MACRO ABBREVIATIONS

At computer-user meetings, I notice that whenever someone mentions an abbreviation for a macro key word, there are many "oohs" and "aahs." Learning macro abbreviations is always new and exciting for somebody.

The following table shows some of the shortcuts I use.

Macro Key Word	***Abbreviation***
{BACKSPACE}	{BS}
{DELETE}	{DEL}
{DOWN}	{D}
{ESCAPE}	{ESC}
{LEFT}	{L}
{RIGHT}	{R}
{UP}	{U}

You can also abbreviate with the /X commands, though I am often reluctant to do so. They're shorter, but they can be confusing. Even if you don't use the /X commands, you should know them so that you can understand macros written by others. The following table shows some macro commands and their /X equivalents.

Macro Command	***/X Equivalent***
{location}	/XClocation~
{BRANCH location}	/XGlocation~
{GETLABEL prompt,location}	/XLprompt~location~
{GETNUMBER prompt,location}	/XNprompt~location~
{IF condition}	/XIcondition~
{MENUBRANCH location}	/XMlocation~
{QUIT}	/XQ
{RETURN}	/XR

One other macro feature many people overlook is the repetition argument. For example, instead of writing {LEFT}{LEFT}{LEFT}, you can write {LEFT 3}. The repetition argument works with the following macro key words: {ABS}, {BIGLEFT}, {BIGRIGHT}, {BS}, {CALC}, {DEL}, {DOWN}, {EDIT}, {END}, {ESC}, {GOTO}, {GRAPH}, {HOME}, {LEFT}, {NAME}, {PGDN}, {PGUP}, {QUERY}, {RIGHT}, {TABLE}, {UP}, and {WINDOW}.

You can use the repetition argument with either a key word or its abbreviation. You will probably never use the repetition argument with some commands. But for many commands, it saves a lot of typing.

Jeff Junkermeier
Shorewood, Minn.

A TOOLBOX FOR SYMPHONY

I'm having a problem getting a model to work. You published the model in "How to Build a Versatile Toolbox" in the September 1989 issue (page 32). I know it's a *1-2-3* model, but I see no reason why it shouldn't work in *Symphony* Release 2.0.

I tried to enter the formula for cell B9, but *Symphony* won't accept it. It beeps and the cursor moves to the 7 in the first @STRING function in the formula. Then, because I didn't know what the function of the exclamation points was, I removed them all. I ended up with the following formula in cell B9:

```
+"{"&routine&@IF(@CELL("type",arg1)="v",""
  &@STRING(arg1,7)&@IF(@CELL("type",arg2)
  ="v",",",&@STRING(arg2,7)&@IF(@CELL
  ("type",arg3)="v",",",&@STRING(arg3,7)
  &@IF(@CELL("type",arg4)="v",",",&@STRING
  (arg4,7),""),""),""),"")&"}~"
```

Symphony accepted the formula, but the macro still didn't work. What's wrong with this formula? What are the exclamation points in the published model for?

L. E. Thielen
Thielen Consultants Inc.
Villa Park, Ill.

The editor replies: There's nothing wrong with your formula. The exclamation points tell *Symphony* that the range names in the formula refer to single-cell ranges. This convention was necessary in earlier releases of *Symphony*, but oddly enough it doesn't always work in Release 2.0. Your formula works the way it's supposed to in Release 2.0, so that's not the problem. Recheck all your range names and macro labels against the ones shown in the article.

PROTECTING MACROS

In the February 1988 Symphony Macros column (page 36), you discussed a question from Debbi Hill of Houston. That question concerned the problem of a macro crashing after it deletes rows or columns.

I get around this type of problem by creating a separate window called MACROS in an unused area of the worksheet. I restrict the range of the MACROS window and other windows so that an operation performed in one doesn't affect data in others. Once the macro is written and debugged, I hide the window. I use that window again only when I want to look at the macros.

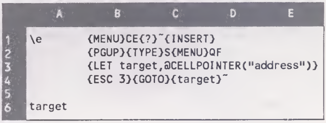
Glenn Evans
Avon Products Inc.
New York, N.Y.

The editor replies: Paula Behan of Fort Washington, Pa., also sent us that solution. If you use *Symphony* Release 1.1 or higher, you can also use the MACROMGR.APP facility to move the macros into Hyperspace. To do this, press SERVICES and select Application Attach. Then select MACROMGR.APP, press Return, and select Quit. Press SERVICES, select Macros Save, and enter a name for the macro library. Indicate the range in your worksheet that contains your macros and press Return. Select No if you don't want to lock the macro library with a password. The macro disappears from your worksheet, but *Symphony* creates a copy of the macro on disk and in RAM.

To bring the macros into memory in a future session, attach MACROMGR.APP, press SERVICES, select Macros Load, select the name you gave your macros, press Return, and select Quit.

TO SHEET FROM FORM

I have a *Symphony* Release 2.0 database that has more than 1,000 records. I often need to see several records at once or make changes in some of them. But only one entry is visible at a time in a FORM window. I also can't make any changes in a SHEET window after issuing a Query Find command. So I wrote a macro to let me jump from the FORM window into the SHEET window at the first record that matches a criterion. The macro lets me look at or change one or more records in the worksheet. I can then jump back into the FORM window by pressing SWITCH (Alt-F9 on most computers).



```
\e        {MENU}CE{?}~{INSERT}
          {PGUP}{TYPE}S{MENU}QF
          {LET target,@CELLPOINTER("address")}
          {ESC 3}{GOTO}{target}~

target
```

To build the macro, enter the labels as shown. Use the Range Name Labels Right command to assign the labels in column A as range names for the adjacent cells in column B. To run the macro, hold down the MACRO key (Alt on most computers) and press E.

Here's how it works:

{MENU}CE{?}~{INSERT} issues the Criteria Edit command and pauses to let you edit the current criterion. After you press Return, the macro presses Return and presses the Insert key to save the new criterion.

{PGUP}{TYPE}S{MENU}QF returns to the first record in the FORM window. The macro then changes to the SHEET environment and issues a Query Find command.

{LET target,@CELLPOINTER("address")} stores the address of the current cell in the cell named *target*.

{ESC 3}{GOTO}{target}~ returns to SHEET mode from FIND mode. The macro then moves the cell pointer to the address stored in the cell named *target*.

Bill McLain
Western Baptist Hospital
Paducah, Ky.

FOR DEVELOPERS { }{ }{ }{ }

Where Am I?

Create models that figure out what release of *1-2-3* or *Symphony* they're in.

BY DAVID DEVEREAUX-WEBER

Many developers use *1-2-3* and *Symphony* to create models for design and analysis. But the many releases with varying capabilities can make for development headaches. Rather than develop different models for each release, you can develop one model that works in slightly different ways, depending on the release it's running in. By including macros that can identify the environment, your models can have wider application, or simply tell users that they won't work in their particular spreadsheet programs.

Consider the difference between *1-2-3* and *Symphony*. While their worksheet files are compatible, their menu sequences are different. Since their menus are different, macro command sequences for each product are also different. For example, the *1-2-3* macro sequence to print a range named *balance* is:

```
/PPRbalance~AGQ
```

The *Symphony* macro command sequence for the same operation is:

```
{SERVICES}PSSRbalance~QAGQ
```

If you specify the current program in a cell named *pr*, you can combine the macros in a single worksheet as follows:

```
{IF pr="123"}/PPRbalance~AGQ
{IF pr="Symphony"}{SERVICES}
PSSRbalance~AQGQ
```

The macros in figure 1 let you create a single model that runs without modification in either *1-2-3* or *Symphony*. These macros first figure out whether they are running in *1-2-3* or *Symphony*, then determine the release of the program. This means that you can write separate macro sequences for *1-2-3* and *Symphony* in the same worksheet, ensuring that your macros will run the correct menu sequences. Your macros also can tell the user if the model requires a feature or features that the user's release does not support.

The macros in figure 1 work in *1-2-3* Releases 1A, 1A*, 2, 2.01, 2.2, 3, 3.1, and *1-2-3*/G, as well as *Symphony* Releases 1, 1.1, 1.2, 2.0, and 2.2 (the macro identifies *Symphony* 1.01 as 1). You should be able to modify them to work in *1-2-3/M*, or *1-2-3* for other platforms like DEC, Unix System V, and Sun, simply by using the @INFO("*system*") formula in addition to the @INFO("*release*") formula.

WORKSHEET FILE INCOMPATIBILITIES

Files created in *Symphony* may have a variety of features that are not available in *1-2-3*. For instance, *Symphony* doesn't automatically run the \0 macro, as *1-2-3* does. In *Symphony* you must specify the cell address or range name of the macro you want to autoexecute with the SERVICES Settings Auto-Execute command. *1-2-3* ignores this setting when it loads the *Symphony* file and instead runs the \0 macro (if there is one). Further, if you load the *Symphony* file into *1-2-3* and then save it in *1-2-3*, you lose *Symphony*'s autoexecuting macro setting.

These differences affect cross-program template development in two ways. First, if you want to develop an autoexecuting macro that people can use in *Symphony* and *1-2-3*, you must at some point in your development and testing edit the file with *Symphony*, set the autoexecuting macro, and then save the file. Second, the automatic macro execution feature in *Symphony* will fail if a user loads and then saves the file in *1-2-3* before loading it in *Symphony*.

There are other differences between *Symphony* and *1-2-3*. For example, some *Symphony* settings that don't exist or are different in *1-2-3* are the settings sheets for multiple windows (including column widths, hidden columns, and cell formats), print settings sheets, database settings sheets, and graph settings sheets.

You must also translate files down to earlier formats if you want the worksheets to run in early releases.

FILE EXTENSIONS

Symphony worksheet files usually have a .WR1 extension. *1-2-3* files usually have a .WK1 extension. When a user wishes to retrieve a file in *1-2-3* or *Symphony*, both programs use their respective default file extensions when retrieving or saving files. *1-2-3* users may not be aware that files with the .WR1 extension are present. Likewise, *Symphony* users may not be aware that files with the .WK1 extension are present. You can override

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these defaults simply by typing the desired extension. For example, a *Symphony* user can select SERVICES File Retrieve and then type * .*WK1* to list all the WK1 files in the current directory.

When retrieving a file with the extension .WR1 in *1-2-3* Release 3.*x*, *1-2-3* stops, beeps, displays an ERROR indicator, and tells you the file extension will be changed to .WK3. This prevents Release 3.*x* from automatically executing the \0 macro. To get around this problem, save the *Symphony* worksheet (in *Symphony*) with the .WK1 extension.

HOW PROGRAM AND RELEASE DETECTION WORKS

The function for determining the release of a program, @INFO("*release*"), is only available in *1-2-3* Release 3.*x* and *1-2-3*/G. In earlier releases of *1-2-3* and in all releases of *Symphony*, you must carefully test for features or functions that perform differently between programs or releases in order to determine the release. In some situations, these differences are undocumented features or irregularities. Ordinarily, you would do well to avoid such programming practices. The risk of using an irregularity as a detection device is that the software's developer might change the irregularity in a maintenance release. If this happened, the tests would not perform as expected. Once a new release of a program is available, there is little chance that such a change would be made to an older release.

Because such differences between releases are undocumented, the process of finding them is difficult. Another challenge is finding macro sequences that correctly identify a particular release or program but do not generate errors that would halt execution of the macro in any other release of *1-2-3* or *Symphony*.

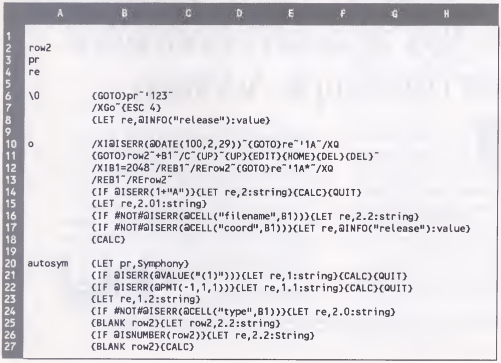
To work best, the tests used in the process should:

1. Run properly in every release of *1-2-3* and *Symphony*
2. Work after repeated saves and retrieves in any release of a program (note the problems between *1-2-3*and *Symphony* templates)
3. Be both forward and backward compatible, which means that if someone saves the macro in *1-2-3* Release 2.2, the macro will still work in Release 2.01

PROGRAM AND RELEASE DETECTION MACROS

The macros below automatically execute upon retrieval of the file that contains them and enter the current program's name as a label in *pr* (cell B3). They then enter the release of the program as a string in *re* (B4). Since *1-2-3* Release 1.0 does not support automatic macro execution, the macros do not identify that release.

With some releases, identification requires more than one test. One way to do this is use the logical operators #AND# and #OR# to combine tests. Our macro method uses sequential logic instead. In sequential logic, tests in successive rows run in order, with macro flow stopping



```
       A          B          C       D       E       F       G       H
 1
 2   row2
 3   pr
 4   re
 5
 6   \0         {GOTO}pr~'123~
 7              /XGo~{ESC 4}
 8              {LET re,@INFO("release"):value}
 9
10   o          /XI@ISERR(@DATE(100,2,29))~{GOTO}re~'1A~/XQ
11              {GOTO}row2~+B1~/C~{UP}~{UP}{EDIT}{HOME}{DEL}{DEL}~
12              /XIB1=2048~/REB1~/RErow2~{GOTO}re~'1A*~/XQ
13              /REB1~/RErow2~
14              {IF @ISERR(1+"A")}{LET re,2:string}{CALC}{QUIT}
15              {LET re,2.01:string}
16              {IF #NOT#@ISERR(@CELL("filename",B1))}{LET re,2.2:string}
17              {IF #NOT#@ISERR(@CELL("coord",B1))}{LET re,@INFO("release"):value}
18              {CALC}
19
20   autosym    {LET pr,Symphony}
21              {IF @ISERR(@VALUE("(1)"))}{LET re,1:string}{CALC}{QUIT}
22              {IF @ISERR(@PMT(-1,1,1))}{LET re,1.1:string}{CALC}{QUIT}
23              {LET re,1.2:string}
24              {IF #NOT#@ISERR(@CELL("type",B1))}{LET re,2.0:string}
25              {BLANK row2}{LET row2,2.2:string}
26              {IF @ISNUMBER(row2)}{LET re,2.2:String}
27              {BLANK row2}{CALC}
```

Here's all the code you need to determine any of the major releases of *1-2-3* and *Symphony*.

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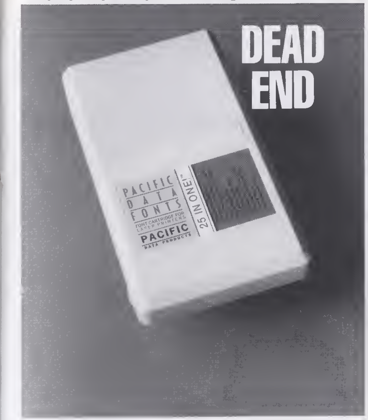

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Z Bats	No	Yes
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Module Price	NA	$99.00
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where appropriate. This technique simplifies the {IF} statements.

RUNNING THE MACROS

Refer to the macro in the illustration. In *1-2-3* the macro with the range name \0 executes automatically. Note that Release 1.0 does not support autoexecute macros and that auto-execute macros can be disabled in Releases 2.2 and 3.*x*.

The macro initially uses the /X key words because the advanced macro key words, such as {IF}, were not available until Release 2. Releases 1A and 1A* can only be detected using the /X key words.

> FILES CREATED IN SYMPHONY MAY HAVE A VARIETY OF FEATURES THAT ARE NOT AVAILABLE IN 1-2-3.

{GOTO}pr~'123~ enters the label *123* in the range named *pr*.

/XGo~{ESC 4} branches control to the range named *o* if the program that retrieves the file supports the /X key words. *1-2-3/*G does not support the /X macro key words. In that program the slash brings up the main menu, the X doesn't do anything (since X is not a menu option), the G selects the Graph menu, the o selects the Options menu, and the tilde (~) selects Titles, the first option in that menu. Then the {ESC 4} command returns to READY mode. If macro control does not branch to the *o* routine, the macro has identified *1-2-3/G*.

{LET re,@INFO("release") :value} places the result of the @INFO function in the range named *re*. At this point, the macro knows the program and release is *1-2-3*/G, so macro execution stops. (Editor's note: On our copy of *1-2-3/G,* the @INFO("*release*") formula returned G1.77.1.)

If the macro control does pass to the *o* routine, here's what happens:

/XI@ISERR(@DATE(100,2,29))~{GOTO}re~'1A~/XQ determines if the release is earlier than 1A*. Releases 1.0 and 1A of *1-2-3* had an irregularity in the @DATE function. In these releases the @DATE function returns ERR for @DATE(100,2,29), so the macro moves the cell pointer to the range named *re* and enters the label *1A*. Because Release 1.0 does not support automatic execution of the \0 macro, we are unable to identify it using the methods described here. But since there are few remaining users of Release 1.0, this should not present a serious problem.

{GOTO}row2~+B1~/C~{UP}~{UP}{EDIT}{HOME}{DEL}{DEL}~ moves the cell pointer to the cell named *row2*, enters the formula +B1, and then copies that formula up to cell B1. Since +B1 is a relative reference, and since it refers to the first row, when the copying takes place the row number wraps around to the last row in the spreadsheet. The next commands edit this new formula, moving the cursor to the far left and deleting the plus sign and the letter B. What remains is simply the row number of the bottom row of the worksheet. The tilde completes the edit.

A cell reference is necessary here because the formula must be copied from row 2 to row 1. The range name, *row2*, reminds you that this range must always be in the second row, so that the formula refers to the first row of the spreadsheet. If you want to move the macro elsewhere in the worksheet, you must change all references to cell B1 accordingly, but they must always refer to some cell in row 1.

/XIB1=2048~/ REB1~/ RErow2 ~{GOTO}re~'1A*~/XQ determines whether cell B1 contains the value 2048. If it does, the macro erases cell B1 and range *row2*, moves the cell pointer to *re*, enters the label *1A**, and stops macro processing. Release 1A* was the last release to have 2,048 rows. Since we have already eliminated release 1A in earlier steps, the release must be 1A* if cell A1 is equal to 2048. If the test for release 1A* fails, we can now start using advanced macro key words, such as {IF} and {LET}, for all subsequent tests.

/REB1~/RErow2~ erases the entries in cells B1 and row 2.

{IF @ISERR(1+"A")}{LET re,2:string}{CALC}{QUIT} tests for an irregularity that occurs only in *1-2-3* Release 2. In this release, calculations that mix numbers and strings generate an error. If the result of 1+"A" is ERR, the macro enters *2* in *re*, recalculates the worksheet, and halts macro processing.

{LET re,2.01:string} places the label *2.01* in range *re,* but at this point it does not stop macro execution. The macro uses sequential logic to identify Release 2.01. It has eliminated releases earlier than 2.01, but not 2.2 or 3.*x*. Macro execution tests the next row for these.

{IF #NOT#@ISERR (@CELL("filename",B1))}{LET re, 2.2:string} checks the validity of using the attribute argument *filename* to the @CELL function. This argument first appeared in Releases 3 and 2.2. If the formula doesn't generate an error, the macro enters the label *2.2* in *re.* If it does generate an error, Release 2.01 is confirmed. The *filename* attribute is also valid in Release 3.*x*. Continuing to use sequential logic, the macro confirms Release 2.2 only upon failure of the test for Release 3.*x*. The @CELL argument, *B1,* holds no significance in this step and is not actually used in the function. Still, the second argument must be a valid cell reference.

{IF #NOT#@ISERR(@CELL("coord",B1))}{LET re, @INFO("release"):value} tests for Release 3.*x* by using

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the *coord* attribute. This attribute argument for the @CELL function became available in Release 3. If the formula doesn't generate an error, the macro enters the value of the new @INFO("*release*") function in *re.* (Editor's note: In our copy of *1-2-3* Release 3, the @INFO("*release*") formula returned the string 3.00.00. In Release 3.1 the formula returned the string 3.10.00.)

If you need to differentiate between the original version of *1-2-3* Release 3 and the *1-2-3* Release 3 Replacement Disk version, you can use the date of the 123DOS.EXE file. The original shipped version of 123DOS.EXE was dated 6-19-89. The Replacement Disk version of 123DOS.EXE was dated 3-01-90. You can use the File Admin Table command to determine the date of the 123DOS.EXE file, using something like the following: /FATO{CE}123dos.exe~~{R}/RFD3~.

{CALC} recalculates the worksheet. Macro execution in the *1-2-3* release identification section stops here.

DETERMINING THE RELEASE IN SYMPHONY

Symphony does not automatically execute the macro named \0. To specify an autoexecuting macro in *Symphony,* first select SERVICES Settings Auto-Execute Set and enter *autosym.* Then save the worksheet. The next time you load the worksheet in *Symphony, autosym* will automatically run. Again, you can save the worksheet as a WK1 file.

The macro knows it is in *Symphony* because the program is running the *autosym* routine. So the first command in *autosym* is {LET pr,Symphony}, which assigns the label *Symphony* to the range named *re.*

Here's how the rest of the macro works:

{IF @ISERR(@VALUE("(1)"))}{LET re,1.0:string}{CALC}{QUIT} determines whether the program is *Symphony* Release 1.0 by using an irregularity in the @VALUE function. In Release 1 the @VALUE function did not support the use of parentheses as an indication of negative numbers. If the formula evaluates to ERR, the program is Release 1. Then the macro enters the label *1* in *re,* recalculates the worksheet, and halts macro processing. Note that the model identifies *Symphony* Release 1.01 as Release 1.

{IF @ISERR(@PMT(-1,1,1))}{LET re,1.1:string}{CALC}{QUIT} identifies *Symphony* Release 1.1 using an irregularity in the @PMT function. In release 1.1 the @PMT function did not support the negative number as the first argument. If the formula evaluates to ERR, the program is Release 1.1. In that case the macro enters the label *1.1* in *re*, recalculates the worksheet, and then halts macro processing.

{LET re,1.2:string} starts the process of identifying *Symphony* Release 1.2 by sequential logic. Once the macro has ruled out all other releases, it deduces that it is running in Release 1.2. The process of identifying Release 1.2 by elimination continues in the next row.

{IF #NOT#@ISERR(@CELL("type",B1))}{LET re,2.0:string} identifies *Symphony* Release 2.0 by using an improvement in the way *Symphony* deals with the entry of ranges in some functions. For example, in releases before 2.0, if the second argument in the @CELL function is not a range, such as B1..B1, the result is ERR. If the macro uses a single cell reference and no error results, the release must be 2.0 or higher. The macro rules out Release 1.2. Release 2.2 continues the improvement in range entry. The macro continues to use sequential logic to confirm Release 2.0 in the next row. The argument of B1 holds no significance in this step. However, the second argument of the @CELL formula must be a valid single-cell address.

{BLANK row2}{LET row2,2.2:string} begins the process of identifying Release 2.2. The macro erases the cell named *row2* in preparation for the next test. The macro then uses the {LET} command to assign the string *2.2* to the range named *row2.* Note that the argument in the {LET} command is case sensitive and must be entered exactly as shown to work properly.

{IF @ISNUMBER(row2)}{LET re,2.2:String} identifies Release 2.2 of *Symphony* by a subtle irregularity in the way the {LET} key word operates in Release 2.2. The suffix *string* should tell *Symphony* to interpret the characters after the comma in the {LET} statement as a string. The irregularity is that if all the letters in the word *string* are lowercase, *Symphony* interprets the characters in the {LET} statement as a value instead. The macro uses the @ISNUMBER function to check the value placed in *row2.* If *row2* contains a number, the program is Release 2.2, not Release 2.0, and the macro enters the label *2.2* in *re.* Again, the arguments in the {LET} command are case sensitive.

{BLANK row2}{CALC} erases the entry in *row2* and recalculates the worksheet. The *Symphony* identification process is complete.

USING THE MACRO

If you want to build a model that works in multiple releases of *1-2-3* and *Symphony* or on different platforms, you'll have to do extensive design work and program verification. "A Compatibility Guide" in the October 1989 issue will help you decide whether a feature is available in a particular program release.

David Devereaux-Weber is an engineer with American Communications Consultants Inc., in Madison, Wis. You can reach him at 608-845-4420, on CompuServe 74025,471 or via MCI Mail number 223-0391.

The model in this article can be downloaded from CompuServe. For more information, see the box on page 4.

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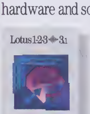

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TECHNIQUES

LIFE in the FAST LANE

Use the GOTO, End, and NAME keys, as well as windows, worksheet titles, and hidden columns to chart a clear course through a large worksheet.

BY DANIEL GASTEIGER

A sprawling spreadsheet means a lot of work. Navigating from section to section isn't easy. Building a formula that relies on data stowed hundreds of rows away can require many repetitive keystrokes, and in a large model, observing the effect a minor change has on other data is a logistical challenge.

Don't be daunted by a large spreadsheet. Techniques for quickly moving the cell pointer from cell to cell and for physically reducing the working area let you move about the worksheet with ease. Among the tricks for shrinking the sheet are adding titles, creating a second window, and hiding columns.

Fast Navigation

The simplest way to shrink a spreadsheet is to navigate efficiently. The Arrow keys manage small hops from cell to cell. The PageUp, PageDown, Control-RightArrow, Control-LeftArrow, and Home keys allow you to take slightly bigger trips.

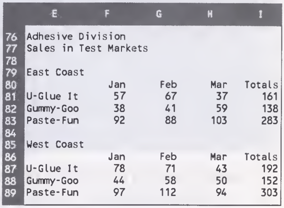
For example, PageUp and PageDown move the cell pointer up and down one screen, respectively. In both *1-2-3* and *Symphony*, Control-RightArrow moves the cell pointer right one screen, and Control-LeftArrow moves the cell pointer left one screen. In *1-2-3* only, the Tab key moves the cell pointer right one screen, and the Backtab key moves the cell pointer left one screen. The Home key moves the cell pointer to cell A1, and End-Home moves the cell pointer to the lower-right corner of the active area of the worksheet. *1-2-3* Release 3 contains other keys that allow you to move the cell pointer between worksheets and active files. See the reference manual for a complete list.

Of all the pointer-movement keys, the End key is the most versatile. When used in combination with other pointer-movement keys, the End key uses worksheet data to determine how far to move the cell pointer.

To see the End key in action, build the small worksheet shown below.

Begin in a blank worksheet. Enter the labels shown in rows 76 through 85. Right-align the labels in row 80. Select /Range Label Right (in *Symphony*, MENU Range Label-Alignment Right) and specify range F80..I80. Then copy range E80..I83 to cell E86. Enter the values shown in ranges F81..H83 and F87..H89. Next, enter the formula @SUM(F81..H81) in cell I81. Copy that formula to ranges I82..I83 and I87..I89. Now select /Range Name Create (in *Symphony*, MENU Range Name Create), enter the name *east*, and specify range E79..I83. Use the same process to assign the name *west* to range E85..I89.

Move the cell pointer to cell E81. Press the End key followed by the RightArrow key. The cell pointer moves to cell I81, the last contiguous data-filled cell to the right. With the cell pointer in cell I81, press the End key followed by the DownArrow key. The cell pointer jumps to cell I83, the last contiguous data-filled cell in that direction. Press the End key and the DownArrow key again. The cell pointer jumps to cell I86, the first data-filled cell following the gap of blank cells. Press the End key followed by the LeftArrow key. The pointer moves to cell F86. Press the End key and the LeftArrow key again. The cell pointer lands in column A because there are no data-filled cells in row 86 between cell F86 and cell A86.



	E	F	G	H	I
76	Adhesive Division				
77	Sales in Test Markets				
78					
79	East Coast				
80		Jan	Feb	Mar	Totals
81	U-Glue It	57	67	37	161
82	Gummy-Goo	38	41	59	138
83	Paste-Fun	92	88	103	283
84					
85	West Coast				
86		Jan	Feb	Mar	Totals
87	U-Glue It	78	71	43	192
88	Gummy-Goo	44	58	50	152
89	Paste-Fun	97	112	94	303

JUDY FILIPPO

The End key speeds your work in any spreadsheet. Consider a procedure that quickly copies a single formula down a column. Suppose that range A80..A90 contains values and that cell B80 contains the formula +200*A80. To copy the formula down the column, position the cell pointer in cell B80. Select /Copy (in *Symphony*, MENU Copy) and press Return. Then press the DownArrow key, the period key, the LeftArrow key, the End key, the DownArrow key, the RightArrow key, and Return. These keystrokes copy the formula to each cell in the target range, no matter how many there are.

The Direct Route

Once you know where you're going, the GOTO key (F5 on most computers) makes pointer movements lightning fast. The GOTO key uses the cell address or named range that you specify as the destination for the cell pointer. Press GOTO and enter a cell address. The cell pointer immediately jumps to that cell.

If a worksheet contains named ranges, the GOTO key combined with the NAME key in *1-2-3* or the MENU key in *Symphony* allows you to move the cell pointer to the upper-left cell of the named range that you specify.

Try sending the cell pointer to a named range. Make sure that the worksheet that contains the Adhesive Division data is current. Then press the GOTO key followed by the NAME key (in *Symphony*, press the GOTO key followed by the MENU key). A list of named ranges appears in the control panel. Since the sample file contains only two named ranges, viewing a full-screen list isn't necessary. But go ahead and press the NAME key (in *Symphony*, MENU) again. Point to the range name *west* and press Return. The cell pointer jumps to cell E85, which is the top-left cell in the range named *west*.

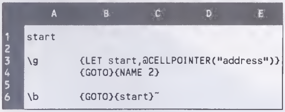
Sometimes it's useful to examine a named range elsewhere in the spreadsheet and then return the cell pointer to its starting cell. There are two easy ways to do this. One method is command-based; the other relies on two simple macros. The one you use depends on whether you want to move the cell pointer again once it arrives at the range.

If you've forgotten which data a particular range name represents or if you want to double-check the dimensions of the named range, use the command-based method. Select /Range Name Create (in *Symphony*, MENU Range Name Create) and either enter the range name or select it from the list in the control panel. No matter where the cell pointer is when you issue the command, the program highlights the existing range definition and shifts the display to show some portion of the highlighted range. The control panel also indicates the full range address. Don't move the cell pointer after it has arrived at the range; doing so adjusts the dimensions of the named range.

Try this process on the range named *west*. Then after examining the range, press Escape six or seven times to return to Ready mode (in *Symphony*, SHEET mode). The cell pointer returns to the cell it started in. You can press Return to terminate this process as long as you haven't adjusted the range dimensions, but remember that doing so reassigns the range name and starts worksheet recalculation.

If you want to move the cell pointer through a range, perhaps to reveal underlying formulas, use the macros shown in the figure below.

To build the macros, enter the labels as shown in the figure. Be sure to preface the labels in cells A3 and A6 with an apostrophe. *Symphony* users must replace the command shown in row 4 with {GOTO}{MENU}{MENU}. To assign the labels in column A as names for the adjacent cells in column B, select /Range Name Labels Right (in *Symphony*, MENU Range Name Labels Right) and specify range A1..A6.



```
        A         B         C         D         E
1   start
2
3   \g        {LET start,@CELLPOINTER("address")}
4             {GOTO}{NAME 2}
5
6   \b        {GOTO}{start}~
```

Now test the macros. Move the cell pointer to another area of the worksheet—for example, to cell A41. Hold down the MACRO key (Alt on most computers) and press G. The macro records the address of the current cell—in this case, cell A41—in cell B1. Then it presses the GOTO key once and the NAME (in *Symphony*, MENU) key twice to display a full-screen list of all the named ranges in the file.

You can either highlight a name and press Return or enter a cell address or range name and press Return. Specify the range named *east*. The cell pointer jumps to cell E79, the upper-left cell of the range. Now you're free to move the cell pointer from cell to cell. After examining the worksheet, press MACRO-B to return the cell pointer to its starting location. The macro named *\b* presses the GOTO key, calls the cell named start (a subroutine that types the stored starting address as the destination for the cell pointer), and presses Return.

Restricted Travel

Sometimes, reducing the working area of the spreadsheet simplifies your efforts. Worksheet titles do just that. They are particularly handy when columns or rows contain labels that describe data spread across hundreds or thousands of cells.

You can create worksheet titles in four steps. First, choose the rows you want to use as horizontal titles. Using the small model created earlier, make rows 76 and 77 into titles. Second, use the pointer-movement keys to adjust the worksheet display so that rows 76 and 77 appear directly below the frame of the worksheet.

Third, move the cell pointer to any cell in the row directly below the bottom title row. Here, any cell in row 78 will do. Fourth, select /Worksheet Titles Horizontal (in *Symphony*, MENU Settings Titles Horizontal Quit).

Now the cell pointer can no longer move above row 78, except when the program is in Point mode. More important, as you move the cell pointer through rows 96, 97, 98, and beyond, the title rows remain in view while the top rows of the East Coast data scroll off the display. Continue moving the cell pointer down the worksheet and eventually even the West Coast data scrolls out of view.

A similar procedure locks in columns as vertical titles. The only difference is that you adjust the display so that the title columns appear directly to the right of the left frame of the worksheet. Then before selecting /Worksheet Titles Vertical (in *Symphony*, MENU Settings Titles Vertical Quit), position the cell pointer in any cell in the column directly to the right of the columns to be used as titles.

A third option is to use both horizontal and vertical titles at once. To do that, adjust the worksheet display so that the rows and columns you want to use as titles are up against the worksheet frame. Move the cell pointer to the cell in the upper-left corner of the area that will remain active—in this example, row 76 should be the top row visible, column E should be the leftmost column visible, and the cell pointer should be in cell F78. Select /Worksheet Titles Both (in *Symphony*, MENU Settings Titles Both Quit). Now wherever the cell pointer travels, rows 76 and 77 and column E remain in view. And when you press the Home key, the cell pointer hops to cell F78.

When you're ready to remove the titles, select /Worksheet Titles Clear (in *Symphony*, MENU Settings Titles Clear Quit).

Uncharted Territory

Nothing brings data together more dramatically than hiding columns. Simply decide which columns or groups of columns should appear next to each other, select /Worksheet Column Hide (in *Symphony*, MENU Width Hide), and specify the intervening columns.

For example, suppose you want to see columns E and AE next to each other. Select /Worksheet Column Hide (in *Symphony*, MENU Width Hide) and specify a range that includes columns F through AD. Columns E and AE are now adjacent.

If you want to copy or move hidden data or perform any other worksheet operation on the data, you must expose the hidden columns. In most cases, when the program is in Point mode, hidden columns are exposed and identified by an asterisk that appears adjacent to the column letter.

However, when you press the GOTO key, which puts the program into Point mode, the hidden columns are *not* exposed. If you enter the address of a cell in a hidden column, the ERROR indicator flashes, and the message *Column hidden* appears at the bottom of the screen.

A second exception occurs in *Symphony* only. If you are writing a formula in *Symphony* and the program goes into Point mode, hidden columns are not exposed.

A third exception to the Point mode phenomenon occurs when you specify a Print range. Assigning a Print range doesn't cause hidden columns to appear. The specified Print range may include the hidden columns, but the data in those columns won't appear on the printout.

To expose columns that you have hidden, select /Worksheet Column Display (in *Symphony*, MENU Width Display) and specify the columns marked with an asterisk.

A Window View

Using windows gives you more than one perspective on the same worksheet. Using a second window on the worksheet, you can quickly get from one point to another. In *1-2-3*, only two vertical or two horizontal windows are possible. *Symphony* allows for two or more windows and includes commands that modify window size, layout, and type and restrict the range of each window. You can explore those *Symphony* options on your own. Here we'll concentrate our efforts on splitting the *1-2-3* and *Symphony* display into two windows.

Before creating the windows, enter the following values in the cells indicated:

Cell	***Value***
G1	62
G2	56
G3	95
G1499	17.75

You'll use this data in a moment to see how windows reduce your spreadsheet work. In *1-2-3*, the cell pointer's location determines how big each window will be. To create two horizontal windows in the sample worksheet, press the Home key and in *1-2-3*, move the cell pointer to any cell in row 10. Then select /Worksheet Window Horizontal (in *Symphony*, SERVICES Window Pane Horizontal-Split). A second worksheet frame appears on the display. Its top border crosses the center of the display, and its left border covers the lower portion of the original frame.

The cell pointer is in the upper window, but you can view data in both windows. To move the cell pointer from the upper window to the lower window, press the WINDOW key (F6 on most computers) once. Then press the PageDown key until the Adhesive Division data appears.

Because this example uses horizontal windows, in *1-2-3* the program simultaneously scrolls both windows as you move the cell pointer horizontally across the columns of the worksheet. (If the windows were vertical, *1-2-3* would scroll both windows vertically as you moved the pointer vertically through the rows of the worksheet.) In spreadsheet parlance, the windows are "synched." The totals in the Adhesive Division model are in column J, just out of view. Press the RightArrow key until they appear. The worksheet in the upper window also scrolls to the left.

In *Symphony* windows are always unsynchronized. To make *1-2-3* windows unsynchronized, select /Worksheet Windows Unsynch. Now pointer movement in one window won't cause the other window to scroll.

There are several advantages to using windows to shrink the worksheet. First, the cell pointer can bounce from one window to another even while the program is in Point mode. Therefore, writing a formula in cell G1500 that relies on data in range G1..G3 is almost as easy as writing the same formula in cell G5.

To see how easy it is, move the cell pointer to cell G1 in the upper window. Then press the WINDOW key and the GOTO key to move the cell pointer to cell G1500 in the lower window. Now suppose that the formula you need is @AVG(G1..G3)*G1499.

Type *@AVG(* and then press the WINDOW key. The cell pointer jumps to cell G1. Highlight range G1..G3 and press Return. The cell pointer jumps back to the lower window. Type *)** and press the UpArrow key once to highlight cell G1499. Press Return and the value 1260.25 appears in the cell.

Window hopping simplifies a process that requires you to specify a range. If the two windows displayed are not synchronized, move the cell pointer to the lower-right cell of the range to specify. Switch windows and move the cell pointer to the top-left cell of the range. Then begin the procedure that calls for the range reference.

For example, to assign the name *taxes* to range B35..R776, use the GOTO key to move the cell pointer to cell R776 in one window. Press the WINDOW key and use the GOTO key to move the cell pointer to cell B35 in the second window. Select /Range Name Create and enter *taxes*. In *1-2-3*, when prompted for the range to name, press the WINDOW key, which instantly highlights range B35..R776. In *Symphony* press the period key or Tab key to anchor the cell pointer and then press the WINDOW key. Finally press Return to accept the range definition.

Beyond simply shrinking the worksheet, adding a second window provides new formatting options. Also, column widths set in one window are independent of those set in the other window. Each window can have its own set of hidden columns and titles. Or one window can exploit hidden columns and worksheet titles while the other offers an unencumbered view of the entire worksheet.

Using the Worksheet Window (in *Symphony*, Window Pane) command, you can split the display either horizontally or vertically. *1-2-3* doesn't allow more than two windows at a time. But with the other tools available, a *1-2-3* worksheet with windows can provide a view of as many as eight distinct areas at once.

Consider a single window that uses both vertical and horizontal titles and one contiguous range of hidden columns. At any given time, the window could reveal the titles rows, the titles columns, and a separate group of columns on each side of the hidden columns. That's four areas in a single window. Set up with entirely different titles in a different range and a different range of hidden columns, the second window could provide a view of entirely different data.

NOTHING BRINGS DATA TOGETHER MORE DRAMATICALLY THAN HIDING COLUMNS.

To return to one full-screen window in *1-2-3*, select /Worksheet Window Clear. In *Symphony* select SERVICES Window Delete, and specify the window to delete. Then select SERVICES Window Layout, highlight the entire screen, press Return, and select Quit. ■

Daniel Gasteiger is a *1-2-3* and *Symphony* consultant in Boston and a contributing editor to *LOTUS*.

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CIRCLE 114 ON READER SERVICE CARD

TECHNIQUES

TAKE IT TO THE LIMIT

1-2-3/G's Solver combines powerful optimization techniques with an intuitive graphical interface.

BY KELLY R. CONATSER

BOB DAHM

In the best of all possible worlds, a company could produce an infinite amount of its product and reap unlimited profits. In the real world, several factors, or constraints, limit the possibilities.

For some problems, a spreadsheet can help you make the most of finite resources. A product manager choosing among manufacturing options for a single product can model the alternatives in any release of *1-2-3* or *Symphony*. So can a money manager tracking the risk and return of a few investments. But how can the manufacturer determine the ideal mix of several products, each with its own demand schedule and profit margin, and all straining for a share of the labor supply and factory time? And how can the money manager minimize the risk when the portfolio grows to dozens of assets, each with its own risk profile?

Real-world scenarios like these, with numerous variables and constraints, are sometimes too unwieldy to be modeled cleanly in a spreadsheet. Such problems require mathematical optimization, also known as linear or nonlinear programming. Mathematical optimization tells you how best to allocate resources to various products or projects.

The techniques used in optimization aren't terribly difficult; you can solve small problems with pencil and paper. But for larger models the process becomes so complicated that until recently it had to be done on a mainframe.

By incorporating the power of optimization into a spreadsheet environment, *1-2-3/G*'s Solver helps you figure out many of the problems that you couldn't quite answer with the spreadsheet's conventional what-if tools, such as @functions, macros, regression analysis, data tables, and the time-honored and time-consuming technique of trial and error. And in a departure from most spreadsheet optimization add-ins and stand-alone software packages, the Solver doesn't force you to express your problem in linear equations—that is, in the form X1 = A1 + B1. The Solver can analyze nonlinear equations as well, a big plus for anyone using @functions, many of which are nonlinear.

Though the Solver can handle fairly large optimization problems, you needn't be an MBA running a multi-million-dollar factory to use it. As optimization technology has migrated from the mainframe to the desktop computer, new applications have sprung up. Now, both linear and nonlinear programming are used in everything from personnel planning to mass mailings. Many managers have begun to use mathematical optimization to help allocate their capital budgets to different projects. "You're just plugging in money instead of nuts and bolts and pieces of metal," observes *1-2-3/G* user Bob Martin, manager of Executive Support Systems at Eaton Corp., an Ohio manufacturer.

The Solver takes full advantage of *1-2-3/G*'s graphical interface to help demystify optimization and make it more applicable to everyday problems. "Compared with other packages I've seen, the Solver is relatively easy," says Randy Ledbetter, an operations-research analyst at IBM's Business Systems Research and Development Center in Raleigh, N.C. "Other products aren't as intuitive."

If you're new to optimization, though, it helps to know the essential concepts before modeling your own problems, large or small. The conceptual framework is actually quite simple, and it can help you decide when and how to use the Solver.

Bring Out Your Best

Figure 1 illustrates a simple linear optimization problem. Wild Gourmets uses corn meal to produce 25-pound sacks of rabbit feed and 10-pound sacks of deer feed. The company's goal is to determine the product mix that maximizes profits.

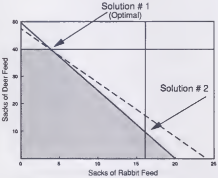
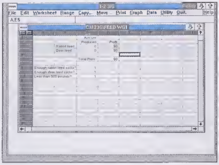


Figure 1. This graph illustrates Wild Gourmets' simple optimization problem. The solid lines represent the constraints: 16 rabbit-feed sacks, 40 deer-feed sacks, and 500 pounds of corn meal. The corn meal is used to make both rabbit feed and deer feed and is represented by the solid sloping line. The line slopes because as more corn meal is used for one product, less is available for use in the other product. Taken together, these constraints constitute the boundary of possible solutions to the problem. The Solver finds solutions at the outer limits of this boundary. It then chooses an optimal solution based on the relationship between rabbit-feed profit and deer-feed profit, represented by the dashed line.



1-2 3/G
Ready
File Edit Worksheet Range Copy.. Move Print Graph Data Utility Quit. Help
A:E5
C:\123G\FEED.WG1

Figure 2. This simple worksheet will optimize the production problem illustrated in figure 1. The Solver will substitute values into the adjustable cells in range C3..C4. The constraints for this problem are the logical formulas in range C8..C10. The Solver will maximize cell D6, total profit.

Several factors limit Wild Gourmets' production options. The company has only 16 rabbit-feed sacks and 40 deer-feed sacks on hand. These two packaging constraints limit the amount of either product that Wild Gourmets can produce.

A third limit on Wild Gourmets' production is the amount of corn meal it has available: 500 pounds. Production possibilities range from 50 sacks of deer feed and 0 sacks of rabbit feed to 0 sacks of deer feed and 20 sacks of rabbit feed. The sloping solid line in figure 1 represents this constraint.

These are the only constraints governing the company's production, so the shaded area in the figure represents Wild Gourmets' range of options. The challenge is to maximize profit given these constraints. Each sack of rabbit feed yields a profit of $6, and each sack of deer feed yields a profit of $3. The dashed line represents the maximum profit that can be obtained given this relationship and the problem's constraints.

You can see how even a simple problem becomes difficult to solve graphically. Fortunately, it isn't hard to express these constraints mathematically:

Rabbit-feed sacks <= 16
Deer-feed sacks <= 40
(Rabbit-feed sacks × 25)
+ (Deer-feed sacks × 10) <= 500

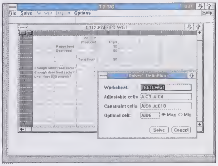
Profit can also be expressed as a formula:

(Rabbit-feed sacks × 6)
+ (Deer-feed sacks × 3) = Profit

Figure 2 shows how to set up such a problem in a worksheet. To duplicate this worksheet, enter all the labels and the two zeros in range C3..C4. Select Range Format Currency, specify 0 decimal places, and indicate range D3..D6.

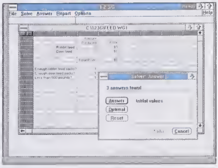
The production levels in range C3..C4, initially set to zero, are the problem's adjustable cells. The Solver substitutes values, derived either algebraically or iteratively, into these cells until it finds the optimal product mix. Adjustable cells must contain a value and, if global protection is enabled, must be unprotected before you can solve a problem.

Range C8..C10 contains the constraints for this problem, each expressed as a logical formula. Enter the formulas at the top of the next page.



Worksheet: FEED.WG1
Adjustable cells: A:C3..A:C4
Constraint cells: A:C8..A:C10
Optimal cell: A:D6 ● Max ○ Min

Figure 3. The Solver's definition window makes it easy to specify the adjustable, constraint, and optimal cells that define your problem. You can define ranges by entering cell addresses or range names, by pointing with the Arrow keys, or by pointing and clicking with the mouse. The definition window normally appears in the lower-left corner of the screen, but in *1-2-3/G* you can place it anywhere.



3 answers found

Initial values

Figure 4. The answer window appears when the Solver has finished working. To view the optimal answer in the worksheet, select Optimal. To view the next-best answer, select Answer. If you continue to select Answer, the Solver will cycle through all the answers it found. To return the worksheet to its original status, select Reset.

Cell	**Formula**
CB	+C3<=16
C9	+C4<=40
C10	+C3*25+C4*10<=500

The formulas in range D3..D4 calculate profits for rabbit feed and deer feed from the amounts the Solver places in the adjustable cells. Enter the following formulas:

Cell	**Formula**
D3	+C3*6
D4	+C4*3

To add these two profit figures, enter the formula @SUM(D3..D4) in cell D6. You want to maximize this total profit, so cell D6 is the optimal cell in your calculation. To solve this problem, select Utility Solver from *1-2-3/G*'s menu. A definition box appears in the worksheet (see figure 3). Specify the following ranges:

Input	**Range**
Adjustable cells	C3..C4
Constraint cells	CB..C10
Optimal cell	D6

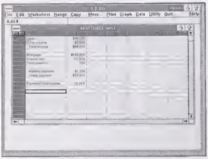
Because you want to maximize profit, specify the Max setting (the default) for

BACKSOLVER: SOLVER'S SIMPLER SIBLING

Have you ever built a model with a specific bottom line in mind, only to find that the results don't quite meet expectations? If your problem can be expressed as a chain of formulas, then *1-2-3/G*'s Backsolver utility can provide the solution.

Consider the common problem of qualifying for a mortgage, shown in simple form in the figure below. The five variables in this calculation are salary, other income, the mortgage amount, the mortgage interest rate, and the mortgage term. To build this problem in your worksheet, enter the variables and labels shown in the figure, and add the following formulas:

Cell	**Formula**
B3	@SUM(B1..B2)
B9	@PMT(B5,B6/12,B7)
B10	+B9*12
B12	+B10/B3



The Backsolver's simple prompts tell you how to get a desired result from a formula by changing a variable cell. In this example, the Backsolver changes the ratio of payment to total income in cell B12 to 30% by altering the interest-rate variable in cell B6.

Use the Worksheet Column Set-Width command to set the width of column A to 14. Assign ranges B1..B5 and B9..B10 the Currency format with no decimal places. Assign cells B6 and B12 the Percent format with two decimal places.

The bottom line here, literally and figuratively, is cell B12: the ratio of the mortgage payment to total income. In this case, the ratio of annual payments to annual income is 32.24%. But what if the maximum ratio the bank will allow is 30%?

The Backsolver can tell you exactly how far you'll have to push any of your five variables to get to the 30% solution. Choose Utility from the main menu, then select Backsolver. A definition window requiring three inputs appears. You can specify these inputs by pointing to worksheet cells with the mouse, by using the Arrow keys, or by typing cell addresses or range names.

The fill-in-the-blanks format of Backsolver's definition window makes it almost impossible to misunderstand the process. Put together, the three prompts read *Make cell* _______ *equal to value* _______ *by changing cell* _______. The cursor automatically resides in the first blank, which appears as a box in the definition window. You want the value in cell B12 to be 30%, so enter *B12* in this first box, or click the mouse on cell B12.

The cursor jumps to the second box, where you specify the desired value for cell B12–in this case, 30%. The cursor then jumps to the third box. Here you can choose any one of your five variables. If you want to know what interest rate will qualify this $120,000, 180-month mortgage, given a $48,000 total income, specify cell B6, the interest-rate variable.

When you enter this third input, the Backsolver immediately solves the problem. Cell B6 shows that when all other variables are held constant, an 8.76% interest rate will bring the payment-to-income ratio down to 30%.

To test a scenario involving another variable, hold down the Alt key and press Backspace to undo the Backsolver's calculation. The interest-rate variable returns to its original value of 10%. Invoke the Backsolver again. Respecify cell B12 as the "make" cell, but this time specify cell B5 (the mortgage variable) as the cell to change. The Backsolver calculates the mortgage amount that will result in a 30% ratio between mortgage payments and total income: $111,669.

When the Backsolver changes the value of a variable, other worksheet formulas that depend on that value recalculate automatically. Suppose you had built a monthly amortization schedule linked to the variables in your worksheet. When you use Backsolver to change one of these variables to meet the 30% payment-to-income requirement, the entire schedule recalculates automatically.

Release 2.*x* and 3.*x* diehards might argue that this problem could just as easily be solved with the Data Table command. But large data tables can be slow to calculate. More important, the data-table approach is useless for "what-iffing" a more complex template, such as a budget or an income statement containing hundreds of formulas. The Backsolver can handle such a problem with ease.

The Backsolver works with almost all @functions, including all of the spreadsheet financial functions. It can even work backward through a lookup table. The Backsolver is limited only by its inability to work with a few @functions, such as the @D functions, which are sometimes useful in a "what-if" analysis.

the optimal cell. Select Solve.

A progress window replaces the Solver's definition box. The Solver first analyzes the problem, searching all active files for formulas and inputs that relate directly or indirectly to the problem. Once this analysis is complete, the Solver begins searching for answers, including the optimal answer.

In this simple problem, there are only three possible answers. When the Solver has found them, it replaces the progress window with the answer window, shown in figure 4. You can move this answer window to another part of the worksheet by clicking the mouse on the window title and dragging it to another location.

To view the optimal answer in the worksheet, select Optimal. The Solver enters *4* in cell C3 and *40* in cell C4, then recalculates the worksheet to reflect your optimal profit in cell D6, $144. To see the Solver's second-best answer, select Answer. The Solver enters *16* in cell C3 and *10* in cell C4, then recalculates the worksheet to show the profit for the second-best scenario, $126.

Select Answer again to see the third solution. The Solver enters a zero in cell C3 and a zero in cell C4. When you begin your problem with zeros in the adjustable cells, the Solver considers zero production to be a viable answer, unless such an answer violates a constraint.

To close the Solver and return to the worksheet, select Cancel Cancel to clear

CAN 4.72 OUT OF 5 DOCTORS AGREE?

If your problem requires a whole-number solution and you come up with nothing but fractions—or worse, fractions rounded to nonoptimal solutions—your fancy footwork may fetch more flak than flattery. *LOTUS* found out the hard way with its July review of *What'sBest!*, a DOS-based linear programming add-in for *1-2-3* and *Symphony* ("The Guns and Butter Equation," page 78).

To demonstrate the power of optimization, the reviewer described a furniture manufacturer's production dilemma. Given a fixed number of cushions, sofa frames, and love-seat frames, what is the most profitable mix of sofas and love seats?

According to *What'sBest!* the answer is 60 love seats and 43.3333 sofas. *LOTUS*'s reviewer rounded this answer to 60 and 43, a sleight of hand that didn't sit well with many readers, who discovered with a little trial and error that the truly optimal solution was 59 love seats and 44 sofas.

The Solver offers no secret weapon for integers-only solutions. Given the same foam-filled problem, the Solver generates the same nearly correct answer: 60 love seats and 43.3333 sofas. Indeed, when asked to optimize a consulting firm's staffing problem in *1-2-3/G*'s 124-page Solver Handbook, the Solver finds a fractional solution. With the fractions rounded, the solution no longer satisfies the problem's constraints.

In most cases, this inability to come up with integer answers doesn't diminish the Solver's usefulness. For problems such as the two presented above, Steve Barlow, product-design manager for *1-2-3/G*, has some simple advice: Use the Solver to get the optimal real-number answer, then "poke in nearby integer values to see what works the best." Barlow notes that many real-world constraints aren't as binding as they seem. The fictional consulting firm, for example, would probably be willing to fudge its constraints a little to hire well-rounded employees.

But there are times when fiddling with your inputs and constraints just doesn't cut it. Some problems, such as the purchasing worksheet in figure 1, are defined by constraints that yield a completely different set of answers when you introduce a whole-number requirement into the optimization process. In these cases, you must structure your problem to come up with a whole-number answer.

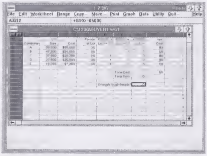

1-2-3/G
Ready
File Edit Worksheet Range Copy Move Print Graph Data Utility Quit Help
C:\123G\BUYER1.WG1

Figure 1. The bulk-buying worksheet. The Solver will substitute values into the adjustable cells in range D3..D7. This zero-production scenario satisfies the constraints in range E3..F7 but not the constraint in cell G12. When the Solver optimizes this model, it will recommend purchase of 100% of supplier A's production and 74% of supplier B's production, for a total of 85,000 toy chimpanzee heads (cell G10) at a total cost of $60,053 (cell H9).

Suppose that you are a buyer for Wholesum Toys, a company that is gearing up for a production of 85,000 "Chimp on a Mission" action figures. Your job is to find the combination of manufacturers who can supply 85,000 tough-looking chimpanzee heads to your factory at the lowest cost. After researching five different suppliers, you construct the worksheet in figure 1.

To build this worksheet, enter the labels in ranges A1..H2, A2..A7, and F9..F10 and in cell E12. Enter the values in range B3..D7.

Enter the following formulas:

Cell	***Formula***
E3	+D3>=0
F3	+D3<=1
G3	+B3*D3
H3	+C3*D3

Copy range E3..H3 to range E4..E7.

Cell	***Formula***
H9	@SUM(H3..H7)
G10	@SUM(G3..G7)
G12	+G10>=85000

Use the Range Format command to assign the Comma format with no decimal places to ranges B3..B7 and G3..G10. Assign the Currency 0 format to ranges C3..C7 and H3..H9 and the Percent 0 format to range D3..D7.

Use the Range Name Create command to assign the name *adjustable* to range D3..D7. Assign the name *constraint* to the collection: E3..E7, G12. Assign the name *optimal* to cell H9.

Columns A through C contain the

Solver's definition box and select Yes to discard the answers the Solver found.

A Problem that Knows No Bounds

Some what-if problems aren't meant for the Solver. Consider the following:

Revenue	$10,000
Cost	–$5,000
Commissions	–$1,000
Profit	$4,000

In this example, revenue and cost are independent variables, and commissions depend on revenue. Suppose that the goal is to raise profits to $5,000 or greater. You might think that this is a job for the Solver. But this problem doesn't fit the basic requirements of optimization because there are no bounds on revenues or costs. For this kind of problem, the Solver returns the error message *Cannot find optimal answer—the optimal cell is unbounded.*

But *1-2-3/G* has a separate utility, the Backsolver, which can get you to your goal by recalculating a single variable. For details on using the Backsolver, see "Backsolver: Solver's Simpler Sibling".

You'll probably want to apply the Solver to more difficult problems than the two-product Wild Gourmets example. Next month we'll model a more sophisticated production mix and provide several tips for setting up your own optimization worksheets in *1-2-3/G*. ■

results of your research. Column D contains the adjustable cells in this problem: How much of each supplier's production you will buy. These cells must contain a value at the beginning of the problem, and they must be unprotected if global protection is enabled. The constraints in column E ensure that the Solver won't return a negative amount of a supplier's production, and the constraints in column F ensure that the maximum purchase won't exceed the supplier's lot size. Column G multiplies the adjustable cell in column D by the size of the lot (column B), and column H multiplies the adjustable cell by the cost of the lot (column C).

To find the optimal purchasing mix, shown below, select Utility Solver and identify the ranges by specifying the range names *adjustable*, *constraint*, and *optimal*.

Specify that you want to minimize the optimal cell, cell H9 (Total Cost), then select Solve.

The Solver finds the following optimal answer: You should buy all the chimpanzee heads produced by supplier A and 74% of those produced by supplier B. Your company's total cost for this optimal purchase of 85,000 toy chimpanzee heads is $60,053.

However, the suppliers may have no use for leftover chimpanzee doll parts and insist that you buy whole lots instead of partial lots. In that case you must force an integer solution by inserting an extra column into your template.

As figure 2 shows, the new problem requires a far different mix of suppliers. The best solution is to buy 100% of the production of suppliers B, D, and E at a total cost of $61,750. This solution is costlier than the first, but it's the best you can do under the circumstances.

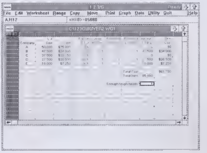


Figure 2. A whole-number requirement radically alters the optimal mix of suppliers. Instead of suppliers A and B, the Solver now recommends suppliers B, D, and E. The formulas in range H3..I9 now depend on the integer values in range E3..E7, rather than the adjustable cells in range D3..D7. Total cost in this scenario is $61,750—higher than the cost in the original scenario, but the best the Solver can do under the circumstances.

The inserted column, column E, contains @INT formulas that return the integer values of the adjustable cells in column D. For example, cell E3 contains the formula @INT(D3). To force an integer solution, you use this integer portion of the adjustable cell, rather than the adjustable cell itself, to calculate the amount to buy in column H and the cost in column I.

To create the template in figure 2, place the cell pointer in column E and use the Worksheet Insert Column command to insert a new column. In cell E3, enter the formula @INT(D3). The constraints in columns F and G remain the same. Edit the formulas in cells H3 and I3 to read as follows:

Cell	***Formula***
H3	+B3*E3
I3	+C3*E3

Copy cell E3 to range E4..E7, and copy range H3..I3 to range H4..H7. Select Utility Solver. Because the adjustable cells, constraint cells, and optimal cell are identified by range names, you can select Solve without making any modifications to the definition box.

The price you pay for an integer solution is increased solving time. The original problem, which had 39 answers (including the optimal answer), was solved on a 16MHz '386SX machine with 6 megabytes of RAM in 1 minute and 24 seconds. When the whole-number requirement was added, the Solver needed 4 minutes and 9 seconds to come up with 18 answers, including the best answer found.

You almost always get a best answer found, rather than an optimal answer, when you force an integers-only solution. This outcome occurs because the Solver knows that the optimal answer contains fractional numbers but that such an answer isn't what you asked for. The only exceptions are for problems whose optimal answers also happen to be whole numbers.

In a large problem, these extra calculations can bog down the Solver. Even a small, well-constructed problem that requires an integers-only solution needs huge amounts of RAM and virtual memory. And an ill-constructed integers-only problem, like any ill-constructed problem, will send the Solver into algebraic oblivion—only sooner.

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APPLICATIONS

The Spirit of @Factory

Real-time data from Lotus's add-in help a Canadian distillery thrive in an evaporating market.

BY KELLY R. CONATSER

On the factory floor at Corby Distilleries Ltd., Art Phelan uses hand-held instruments to measure the alcohol content of whiskey drawn from a nearby holding tank. Repeating the readings aloud, he whips through the pages of a loose-leaf notebook that lists the acceptable standards for different kinds of spirits. "That's right where we want it," he confirms. He takes a whiff of the premium blend, pauses for a moment with the dreamy appreciation of a connoisseur, then dumps the sample–about $35 worth of 12-year-old Park Lane whiskey–into a floor drain.

Some things at 131-year-old Corby are still done by hand, and some may always be done by hand. But the distillery's bucolic isolation in eastern Ontario belies the push toward automation taking place inside its impassive red-brick walls. That effort includes *@Factory*, Lotus Development Corp.'s new real-time link between the factory floor and management's *1-2-3* spreadsheets.

Productivity improvements are the key to Corby's survival in a rapidly evaporating market. Sales of distilled spirits in Canada have slumped 27% from their peak in 1981, the victim of changing lifestyles and increasing taxes. The resulting overcapacity among Canadian distillers has precipitated painful restructuring within the industry. To cope, Corby has pursued an aggressive two-step strategy of acquisition and cost cutting.

The Little Still on the Prairie

In 1987 Corby, 52% owned by Hiram Walker & Sons Ltd., took over an eastern Canadian competitor, McGuiness Ltd. Corby sold McGuiness's physical plant properties to help cover the purchase cost and rolled the operations into its own plant. The takeover pushed Corby's revenues for fiscal 1990 to $113 million (Canadian), making the company the number one purveyor of distilled spirits to the Canadian market. With such brands as Wiser's whiskeys and Lamb's rums, Corby now outsells international giants like Joseph E. Seagram & Sons and Heublein, which concentrate on the U.S. market.

But while the acquisition was a strategic coup, it had the potential to be a logistical nightmare. McGuiness was valuable for its diverse line of specialty liqueurs, but with this diversity came 375 stock-keeping units, up from 120 before the takeover.

To fully exploit this new marketing clout, "the emphasis had to be on our cost of sales," says Elmer Cain, Corby's vice president of operations. First to be scrapped was on-site aging of whiskey, the "raw material" for the bulk of Corby's production. The distillery no longer ages its whiskeys in a cool, musty warehouse a stone's throw from the sleepy Moira River; it trucks them in from parent company Hiram Walker's plant in Windsor. At the other end of the production process, Corby built a $7 million bottling

PHOTOGRAPHY BY DAN HERINGA

Art Phelan Corby Distilleries' superintendent of blending, proudly displays his latest 38 000-liter concoction

Vice President of Operations Elmer Cain surveys Corby's new bottling plant, constructed in 1989 at a cost of $7 million.

plant in the first half of 1989 to handle its increased output.

The last part of the modernization drive targeted the blending operation, the process between aging and bottling. The 39-year-old Phelan, a nine-year veteran of the distillery, was appointed superintendent of blending in February. His goal was clear: better management of blending tanks, including shorter turnaround times and fewer idle hours. "We're like everybody else," Phelan says flatly. "We're trying to cut our lead time between [receiving] an order and actually making the goods and shipping them."

Mix Me a Strong One

Most of the blending operation's efficiency improvements were already in place when Phelan took the superintendent job. In 1989 the distillery installed a $215,000 Bran + Luebbe metering pump to automatically add the exact amount of water, distilled alcohol, flavorings, and other ingredients to the factory's 15 blending tanks. To govern the pump's activity, Corby installed a programmable controller, an industrial computer that regulates manufacturing processes.

Phelan's work group, housed in second-story offices above the factory floor, had also modernized by centralizing its internal operation on a new Compaq Deskpro 386s PC. The Compaq's hard disk holds production data, inventory records, and *1-2-3* files containing the recipes for all 140 of Corby's blended products.

To close the loop on its production investment, Corby needed a real-time link between the factory floor and the offices above. Without the link, a blender had to locate a recipe in the spreadsheet, multiply the ingredient proportions by the desired size of the batch, and print out the number of liters of each ingredient to be used in that particular batch. He then carried the printout downstairs and rekeyed the data into the Allen-Bradley PLC 5/25 that controls the pump, a laborious task accomplished by jabbing the pressure-sensitive keys on the face of the unit with one finger.

"Doing that manually is a real pain in the ass," declares Phelan. An incorrect entry required the operator to recalculate the amounts of all the ingredients to maintain the correct proportions for the blend. In the worst cases, the blenders had to set aside the contents of the tank for reblending within a larger batch, or scrap the tank entirely and redistill its contents.

Most important, manual data transmission wasted precious time during the production day. Blending time for some products can be as short as an hour and a half, and washing a tank to prepare it for the next batch takes no more than 15 minutes. On some days, there was almost enough time to squeeze in an extra batch–but not with manual data transfer. "If data transfer is 15 minutes faster for three batches," confirms Phelan, "we can get an extra batch in."

Enter @Factory

In May Phelan turned to Sutherland-Schultz Ltd. for help in downloading the recipe data. The Kitchener, Ontario, construction-engineering firm and systems integrator had played a key role in the design and construction of the new bottling plant. Sutherland-Schultz's advice was simple: If you're already using *1-2-3*, try Lotus's *@Factory*.

Sutherland-Schultz, whose 1989 revenues were more than $90 million (Canadian), became an *@Factory* value-added reseller (VAR) after searching for "an off-the-shelf application that would allow clients to squeeze more productivity from their existing plant and equipment," says Roy Ojala, Sutherland-Schultz's director of marketing. "Because *@Factory* is available off the shelf, we don't have any risk, we don't have any development time."

Sutherland-Schultz adds value to the *@Factory* package by physically linking a PC to the programmable controller network (installing a network card if necessary) and by supplying terminate-and-stay-resident (TSR) software to complete the link. Because each programmable controller network is different, each requires a different TSR to gather data from the network and transfer it to *@Factory*. VARs like Sutherland-Schultz write these TSRs and bundle them with *@Factory*.

Because of the work the TSRs do behind the scenes, the *@Factory* interface always appears the same to the user. An *@Factory* application can be transplanted from one programmable controller network to another with only minor modification, as long as both networks have a TSR that supports *@Factory*. "The product was designed with that kind of flexibility in mind," explains Jim Convis, the manufacturing marketing manager at Lotus. "We wanted it to be a universal interface to manufacturing information."

@Factory competes in the fast-growing market for low-priced industrial software. A total *@Factory* package, including *@Factory*, *1-2-3* Release 2.2, and a collection of VAR-written TSRs, can cost as little as $2,500 (U.S.). If the customer needs network cards or boards to tap into a programmable controller network, the package can run as high as $5,000. The bottom line for Corby was a PC-to-programmable-controller link that cost about $8,000 less than Phelan had expected to pay for software that supported only the Allen-Bradley programmable controller.

A 50,000-Liter Bottleneck

But automating the batch-downloading process alone doesn't assure scheduling efficiency. Once blending is completed, filtering hoses transfer the blended product to one of 26 stainless steel holding tanks, ranging in size from 7,000 to 53,000 liters, that crowd the floor of the blending factory. The blending operation then waits for its "customer," the bottling plant, to use the finished product.

Once drained by the bottling factory, the holding tank is washed to ready it for the next batch of blended product. Holding tanks that sit full, or partially full, create a bottleneck for the blending operation. As with the blending tanks, "the key for me is to turn the holding tanks over as many times as I can," explains Phelan. "The more times I can fill a holding tank and empty it, the more I can blend."

Once again there was a missing link, this time on the opposite side of the data highway. Corby had installed a second Allen-Bradley programmable controller to monitor holding-tank levels, but the real-time data it gathered weren't available on Phelan's PC. So a member of the

READING AND WRITING ON THE FACTORY FLOOR

Using *@Factory* can be as simple as reading data from a single factory machine through a PC's RS-232 port. But the program's ability to work with multiple programmable controllers was crucial to its acceptance in a more sophisticated manufacturing environment like Corby's. *@Factory*'s two add-in @functions, @READ and @WRITE, allow simultaneous transfer of information back and forth between *1-2-3* and multiple programmable controllers. "You have access to every programmable controller, no matter where it is in the plant," says Roy Ojala, Sutherland-Schultz's director of marketing.

Generally, each programmable controller contains a number of registers that monitor a certain machine or process within the plant. When installing *@Factory*, the customer or VAR sets up a configuration file that assigns each of these registers a tag name–a string that can be used as an argument in the @READ and @WRITE functions. The syntax of the @READ function, for example, is @READ(*device name*,*variable name*, *variable type*,[*domain name*]).

The *device name* argument identifies which programmable controller to read. By specifying a *variable name*, managers can read a particular register on that programmable controller. The *variable type* argument tells the spreadsheet how to display the data–for example, as a floating-point number or as a string. The optional *domain name* argument can be used to specify a group of variables to which the target variable belongs. A second @READ formula in the same spreadsheet can monitor a second register. Corby's tank-monitoring spreadsheet contains 26 @READ formulas, one for each holding tank. The formulas are identical except for their *variable name* arguments.

Entering data manually on the Allen-Bradley PLC 5/25 can be "a real pain in the ass."

The syntax of the @WRITE function is @WRITE(*value*,*device name*, *variable name*,*variable type*, [*domain name*]). Corby's spreadsheet uses *1-2-3*'s @INDEX formula as the *value* argument in the @WRITE formula for its batch downloading. The @INDEX formula looks into the recipe database and finds the correct proportion for a certain ingredient. The spreadsheet then multiplies the ingredient proportion by the size of the batch and writes it to the Allen-Bradley PLC 5/25 that controls the metering pump.

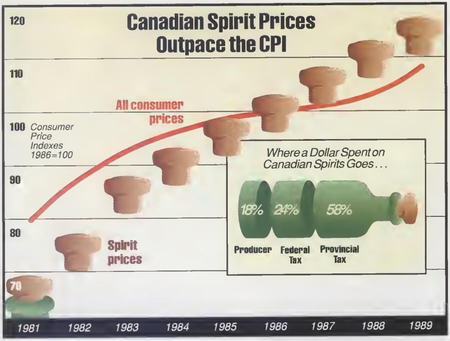


CHART BY PETER ROSS/ROSS CULBERT HOLLAND & LAVERY

blending work group, clipboard in hand, had to climb over a tangle of 3-inch hoses on the factory floor and record readings from pneumatic gauges on the tanks. Phelan sums up the situation with typical directness: "It was awkward and kind of inconvenient, so people didn't do it."

Without regular spot checks to determine the rate at which the bottling plant was draining a tank, it was impossible to predict when the tank would be empty and available for another batch. It might be in a couple of hours or not until the next day. Nobody really knew.

Constantly Reading

Ojala, a newcomer to macros, was responsible for customizing Corby's *1-2-3*/*@Factory* interface. To tackle Phelan's original goal of batch downloading to the metering pump, Ojala used *1-2-3*'s @INDEX function to peer into a spreadsheet database of Corby's 140 secret recipes. The downloading macro automatically multiplies the recipe proportions returned by @INDEX to achieve the desired batch size, then uses these results as arguments in an @WRITE function. With the *@Factory* add-in, the entire process requires a single spreadsheet input. "They choose a recipe number, and it's downloaded immediately to the programmable controller," says Ojala.

To monitor the holding tanks, Ojala wrote a macro that uses *@Factory*'s @READ function to check each tank every five seconds to provide real-time information. Every half hour, the macro writes the current tank levels to a disk file, giving the blending group a continuous record of tank status. If the *1-2-3* file for tank monitoring is currently in the PC's memory, the macro updates it as well with each five-second reading. If it isn't, *@Factory* continues to monitor levels and write them to disk in the background.

"The fact that this can run in the background is probably the most appealing feature," says Phelan. "I want to be able to use that computer to do other things. *@Factory* runs in the background, and when we want to see it, we pull it up and look at it."

Against the Grain

The implementation of *@Factory* and other new technology, such as the metering pump, represented "a cultural change for the people who work here," Phelan says. In September, four months after the new system was installed, Phelan's two assistants, Chris Tylecki and Cam Potts, still doubted its usefulness because of delays in calibrating both the holding tanks and the metering pump.

There is less room for skepticism on the factory floor. The metering pump automates a task that has been done manually since the industry began more than four thousand years ago. The four blenders no longer spend the bulk of their day watching a meter as a hose pumps ingredients into a blending tank. Instead, they're busy unloading barrels of aged whiskey, filling out excise-tax paperwork, and mixing new batches of delicately flavored liqueurs.

Eventually, Corby may be able to get by with fewer blenders, but because it now blends a broad line of liqueurs for its McGuiness label, the floor of the blending operation isn't likely to become fully automated anytime soon. Some batches require only centiliters—no more than a few drops—of concentrated flavoring. That still takes a human touch.

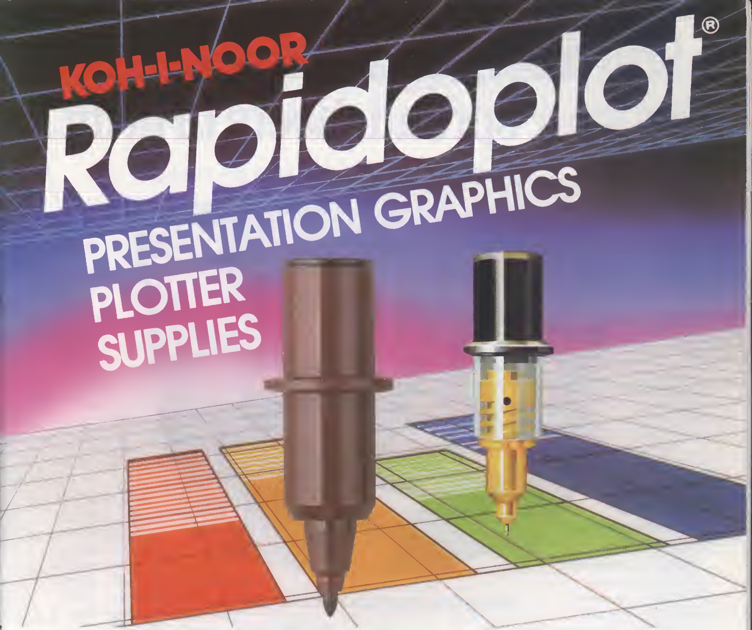
Savoring Success

The real-time link between management and factory floor has proven a vital component of Corby's multi-million-dollar effort to maximize the productivity of the distillery's plant and equipment and keep profits flowing. "The system of doing it all in your head just doesn't work," Phelan says. "*@Factory* allows us to cycle more product through here without increasing the size of the plant."

The capital investment has already begun to filter to Corby's bottom line. In the fiscal year that ended February 28, operating income rose 21%, to $21.2 million, on sales of $104.8 million, defying analysts' expectations of lackluster performance. Return on assets climbed to 11.1%, up from 10.1% the previous year. Since the McGuiness acquisition, Corby "has come a long way in terms of profitability, asset productivity, and marketing and sales effort," says Irene Nattel, an industry analyst at Levesque Beaubien Geoffrion, a brokerage firm in Montreal.

Last year Corby shareholders rejected Hiram Walker's bid to buy the 48% of Corby that it doesn't already own. Nattel expects Walker to repeat the offer and believes that the outcome will ride on "who can hold out longer." In the meantime, she says, "cost control and productivity are critical in a declining market. [Corby is] certainly maximizing the potential of the current situation."

CIRCLE 117 ON READER SERVICE CARD →



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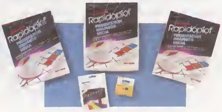

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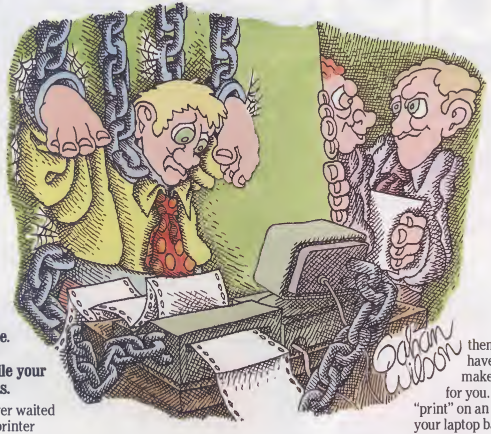

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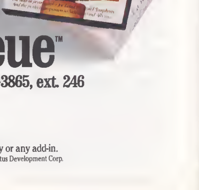

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CIRCLE 118 ON READER SERVICE CARD

PAMELA PRICHETT

APPLICATIONS

INSTANT WEEKENDS

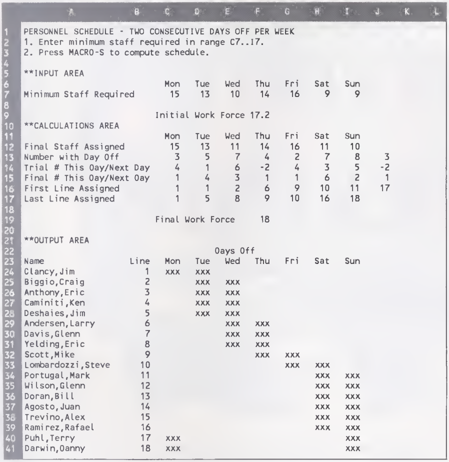
Arrange seven-day work schedules to give every employee two consecutive days off.

BY EVERETTE S. GARDNER JR.

Managers in hospitals, hotels, restaurants, police and fire departments, and other operations that run seven days a week share a common problem in personnel scheduling: how to hire the minimum number of employees and still give each full-time worker two consecutive days off each week. You can create a worksheet in *1-2-3* or *Symphony* (see setup box for details) that solves this problem quickly. This worksheet automatically computes the numbers of people assigned to be on and off duty each day and displays the work schedule in a form similar to a Gantt chart.

Figure 1 shows the input, calculations, and output areas of such a worksheet for a baggage-handling operation at Houston's Intercontinental Airport. Row 7 shows the number of people needed on the job each day of the week. The formula in cell F9 sums the numbers and divides that total by 5, since each employee works five days per week. In this example, the total work force is 17.2. Obviously, you can't have a portion of an employee on duty, so you have to round up to the nearest whole number. To do this, add 0.8, or 4 person-days (0.8 × 5), to the work force.

After entering the values for the minimum staff required for each day in row 7, start the macro in figure 2 to copy these values to row 12 and adjust them to reflect the appropriate number of staff to be assigned each day. The macro locates the lowest value in row 12 and adds one to the staff required for this day. If a feasible schedule can be computed, the macro stops. Otherwise the macro locates the new minimum, adds another person, and keeps going until it finds a solution. To find the minimum staff level, the macro



```
            A            B       C     D     E     F     G     H     I     J     K     L
1  PERSONNEL SCHEDULE - TWO CONSECUTIVE DAYS OFF PER WEEK
2  1. Enter minimum staff required in range C7..I7.
3  2. Press MACRO-S to compute schedule.
4
5  **INPUT AREA
6                              Mon   Tue   Wed   Thu   Fri   Sat   Sun
7  Minimum Staff Required       15    13    10    14    16     9     9
8
9                          Initial Work Force 17.2
10 **CALCULATIONS AREA
11                             Mon   Tue   Wed   Thu   Fri   Sat   Sun
12 Final Staff Assigned         15    13    11    14    16    11    10
13 Number with Day Off           3     5     7     4     2     7     8     3
14 Trial # This Oay/Next Day     4     1     6    -2     4     3     5    -2
15 Final # This Oay/Next Oay     1     4     3     1     1     6     2     1
16 First Line Assigned           1     1     2     6     9    10    11    17
17 Last Line Assigned            1     5     8     9    10    16    18
18
19                         Final Work Force      18
20
21 **OUTPUT AREA
22                                     Oays Off
23 Name                 Line   Mon   Tue   Wed   Thu   Fri   Sat   Sun
24 Clancy,Jim              1   xxx   xxx
25 Biggio,Craig            2         xxx   xxx
26 Anthony,Eric            3         xxx   xxx
27 Caminiti,Ken            4         xxx   xxx
28 Deshaies,Jim            5         xxx   xxx
29 Andersen,Larry          6               xxx   xxx
30 Davis,Glenn             7               xxx   xxx
31 Yelding,Eric            8               xxx   xxx
32 Scott,Mike              9                     xxx   xxx
33 Lombardozzi,Steve      10                           xxx   xxx
34 Portugal,Mark          11                                 xxx   xxx
35 Wilson,Glenn           12                                 xxx   xxx
36 Doran,Bill             13                                 xxx   xxx
37 Agosto,Juan            14                                 xxx   xxx
38 Trevino,Alex           15                                 xxx   xxx
39 Ramirez,Rafael         16                                 xxx   xxx
40 Puhl,Terry             17   xxx                                 xxx
41 Darwin,Oanny           18   xxx                                 xxx
```

Figure 1. This worksheet develops a schedule that lets an employer meet minimum staffing needs while guaranteeing each employee two consecutive days off each week Minimum daily staffing levels are entered in range C7..I7. A macro copies this range to row 12, then adjusts the values in row 12 until the result in cell F19 is an integer and there are no negative values in row 15. Formulas in rows 16, 17, and 24 through 41 produce a Gantt-chart pattern of *xxx* symbols that indicate the days each employee will have off.

starts its search on Monday and continues through Sunday. When there are ties for the minimum, people are added as early in the week as possible. That is, people are assigned to weekend duty only when there is no alternative.

To interpret the solution, examine rows 12 and 13 of figure 1. The numbers of people on duty each day appear in row 12. The numbers of people who have a day off appear in row 13. For example, cell C12 shows that 15 people are working on Mondays, and cell C13 shows that 3 people have Mondays off. The chart in the lower half of figure 1 shows that of these 3, one person has Mondays and Tuesdays off (row 24) and 2 have Sundays and Mondays off (rows 40 and 41). Each of these 18 work schedules resembles a Gantt chart of the days off.

This model isn't a general-purpose scheduling tool. It doesn't deal with issues such as vacations, holidays, turnover, and overtime, all of which may require additional staff. And while it always produces a reasonable schedule, it does not promise to establish the absolute minimum number of employees necessary to implement a five-days-on, two-days-off policy. Finally, it can't decide which employee gets which position. Some managers draw straws. Others let employees choose positions by seniority. The model merely solves the mathematical problem of meeting fluctuating staffing needs while giving each worker two consecutive days off.

Build the model now from the instructions in the setup box. There will be no entries in row 12 of your worksheet until you run the macro. The formulas in rows 13 through 19 will return zeros or ones, and the entries in range C24..I41 won't match figure 1.

The Scheduling Macro

To test the macro that solves the equation, hold down the MACRO key (Alt on most computers) and press S. The macro begins by copying the entries in the range named *reqd* (row 7) to the range named *staff* (row 12). Then it moves the cell pointer to the leftmost cell of *staff* (cell C12). Next, the macro checks to see if it has met its objective. Specifically, it performs an {IF} test to determine if the lowest value in *final* (range C15..I15) is greater than or equal to zero and if the value in the cell named *wforce* (cell F19) is an integer. If both of these conditions are met, the macro beeps, positions the cell pointer on cell A1, and stops. If either condition is not met, the macro proceeds to a second test.

The second test determines whether the value at the current location of the cell pointer is equal to the lowest value in *staff*. If so, the macro adds 1 to the value in the current cell and branches back to the cell named *loop*, which repositions the cell pointer at the leftmost cell of *staff* and performs the first test again. If the second test's condition is not met, the macro moves the cell pointer to the right and checks to see if the cell pointer has gone beyond the rightmost cell of *staff* (into a blank cell), in which case it branches back to *loop*. Otherwise it branches back to *test*, which performs the second test.

Thus, the macro seeks out the lowest value in *staff* and adds 1 to it, then repeats this operation until the value in the cell that displays the final work force is a whole number.

Run the macro again and watch the screen carefully. When the macro copies the sample values from row 7 to row 12, the cell that contains the final work force returns 17.2, a noninteger. On both Saturday and Sunday (cells H12 and I12), a minimum of nine people are required. You see the cell pointer move from left to right until it arrives at cell H12, the first of the two cells that contain 9s. The macro adds 1 to this cell, making Sunday contain the minimum, with 9 people, and changing the value for the final work force to 17.4. The cell pointer sweeps from left to right again and lands on cell I12 (Sunday). The macro adds 1 to this value, making Wednesday, Saturday, and Sunday contain a minimum of 10 workers each. Cell F19 is still a noninteger.

Again the pointer sweeps from left to right, this time landing on cell E12 (Wednesday). Cell E12 is increased by 1. Now Saturday and Sunday contain the minimum number of workers, and cell F19 returns 17.8. Once more, the cell pointer sweeps from left to right and increases the Saturday value by 1. When this happens, cell F19 returns 18, so the macro stops. Row 12 now indicates that to make everything work out, you must assign 15 people on Monday, 13 people on Tuesday, 11 people on Wednesday, 14 people on Thursday, 16 people on Friday, 11 people on Saturday, and 10 people on Sunday.

Assigning Pairs of Days Off

When the macro stops, the numbers of people who have the day off each day is computed in row 13. These formulas simply subtract the values in the cells directly above from the final work-force size. On Monday, 15 people are at work, so 3 people (18–15) have Mondays off. On Tuesday, 13 people are at work, so 5 people (18–13) have Tuesdays off.

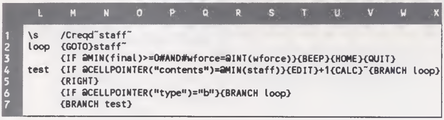
Of the three people who are off on Mondays, one is off Mondays and Tuesdays and the others are off Sundays and Mondays. The formula in cell C15 computes the number of people who are off Mondays and Tuesdays. The remaining formulas in row 15 compute, for each day of the week, the number of people who are off that day and the following day. The formulas in row 14 are intermediate calculations, and their results are not important.

THE MODEL MEETS FLUCTUATING STAFFING NEEDS WHILE GIVING EACH WORKER TWO CONSECUTIVE DAYS OFF.

The solution in row 15 always meets the following set of conditions:

# off Sun/Mon+# off Mon/Tue=
  # off Monday
# off Mon/Tue+# off Tue/Wed=
  # off Tuesday
# off Tue/Wed+# off Wed/Thu=
  # off Wednesday
# off Wed/Thu+# off Thu/Fri=
  # off Thursday
# off Thu/Fri+# off Fri/Sat=
  # off Friday
# off Fri/Sat+# off Sat/Sun=
  # off Saturday
# off Sat/Sun+# off Sun/Mon=
  # off Sunday

Note, for example, that the sum of the values in cells I15 and C15 is 3, the number of people who are off Mondays (cell C13). The values in cells C15 and D15 add up to 5, the number of people off Tuesdays (cell D13), and so on.



```
1  \s    /Creqd~staff~
2  loop  {GOTO}staff~
3        {IF @MIN(final)>=0#AND#wforce=@INT(wforce)}{BEEP}{HOME}{QUIT}
4  test  {IF @CELLPOINTER("contents")=@MIN(staff)}{EDIT}+1{CALC}~{BRANCH loop}
5        {RIGHT}
6        {IF @CELLPOINTER("type")="b"}{BRANCH loop}
7        {BRANCH test}
```

Figure 2. This macro adjusts values in row 12 of figure 1 until it develops a combination that satisfies its mathematical tests.

Solutions that involve negative numbers are mathematically valid, but they don't make sense in the real world. For example, you can't say that negative one worker will have Thursdays and Fridays off. Later on, we'll see why this can be an issue and how the model takes it into account.

The formulas in rows 15 and 16 control the placement of *xxx* symbols in the *Days Off* chart in rows 24 through 41. Cells C16 and C17, for example, contain 1s, meaning that for Monday the *xxx* symbols start and end in line 1 (row 24 of the worksheet). However, the Monday column also contains symbols in lines 17 and 18 (rows 40 and 41 of the worksheet).

The formulas in the Monday column are slightly different from the formulas in the other columns—they each contain a reference to cell J16. The symbols in cells C40 and C41 are paired with the symbols in the last two rows of the Sunday column. The remaining columns of the *Days Off* chart conform to the values in rows 16 and 17 of the worksheet: The symbols in the Tuesday column begin in line 1 and end in line 5, the symbols in the Wednesday column begin in line 2 and end in line 8, and so on.

Other Solutions

Let's change the problem slightly. Suppose the manager decides that 16 baggage handlers are needed on Thursdays. Change the value in cell F7 to 16. The *Initial Work Force* value in cell F9 then changes to 17.6. Press MACRO-S. Watch the screen and you'll see that the macro doesn't stop when cell F19 returns 18 but continues until cell F19 returns 19. This means that to meet staffing needs for all seven days *and* give everyone two consecutive days off, the baggage-handling area must employ 19 handlers.

Update the *Days Off* chart to meet this requirement. Copy range B41..I41 to cell B42 and then enter *New Hire* in cell A42. The 19th worker gets Sundays and Mondays off.

Take another look at the third macro instruction, in cell M3 of figure 2. If this cell did not contain the characters *@MIN (final)>=0*, the macro would stop when the value in cell F19 reached 18. But cell F15 (the number of workers who get Thursdays and Fridays off) would return –1 and the *Days Off* chart would show that the worker in row 8 would get Wednesdays and Saturdays off. This is why the macro requires that cell F19 be an integer and that all the values in row 15 equal at least zero.

Consider a third scenario: Only 8 handlers are needed on Sundays. Erase range A42..I42, change cell F7 back to 14, and change the value in cell I7 to 8. The *Initial Work Force* cell now returns 17. Press MACRO-S to run the macro again. This time, the macro copies the values in row 7 to row 12 and then stops. The last row of the *Days Off* chart shows that the worker in line 18 gets only Mondays off, so the chart appears to be wrong. However, the *Final Work Force* value in cell F19 is 17.

The model in this article can be downloaded from CompuServe. For more information, see the box on page 4.

Modifying the Worksheet

The only necessary modification is to reduce or increase the number of lines in the Gantt chart to handle different numbers of people. If you have fewer than 18 people to schedule, erase as many rows as necessary at the bottom of the *Days Off* chart. If you have more than 18 people, enter the additional names in column A and copy range B41..I41 into as many rows as necessary. Normally, the number in the last line in the chart should agree with the final work-force size in cell F19.

This model is based on a scheduling procedure originally developed by Gail Monroe of Arthur Young and Company. It was described in "Scheduling Manpower for Service Operations," *Industrial Engineering*, August 1970, pages 10 through 17.

Monroe's procedure is still widely used because of its simplicity. Unfortunately, it doesn't guarantee optimal solutions. If absolute efficiency is the key to your operation, you can find more information on optimizing models in "Optimal Scheduling of Two Consecutive Idle Periods," by R. Tibrewala, D. Philippe, and J. Browne, *Management Science*, September 1972, pages 71 through 75.

Everette S. Gardner Jr. is a professor of decision and information sciences at the University of Houston. He developed *Autocast II*, published by Levenbach Associates, Morristown, N.J.

HOW TO SET UP THE PERSONNEL-SCHEDULING WORKSHEET

1. Releases

This model runs in *1-2-3* Releases 2.01 and higher and in *Symphony* Releases 2.0 and higher.

2. Default column width

Width: 6

1-2-3: /Worksheet Global Column-Width, enter *6*
Symph: MENU Settings Width, enter *6*, select Quit

3. Column widths

Column	***Width***
A	22

Position the cell pointer in column A and select

1-2-3: /Worksheet Column Set-Width, enter *22*
Symph: MENU Width Set, enter *22*

4. Labels

Enter the labels shown in column A of figure 1, preceding the entries in cells A2 and A3 with apostrophes. Enter the labels shown in range C6..I6 and right-align this range: Select /Range Label Right (*Symph*: MENU Range Label-Alignment Right) and specify range C6..I6. Copy range C6..I6 to cells C11 and C23. Enter the labels in cells C9, C19, E22, and B23.

Enter the labels shown in figure 2, preceding the labels in cells L1 and M1 with apostrophes. In *Symphony* replace the / in cell M1 with {MENU}.

5. Values

Enter the values shown in range C7..I7 of figure 1. Enter *1* in cells C16, D16, and B24.

6. Range names

Name	***Range***
\s	M1
loop	M2
test	M4

To assign the names above, press / (*Symph*: MENU), select Range Name Labels Right, and specify range L1..L4.

Name	***Range***
reqd	C7..I7
staff	C12..I12
final	C15..I15
wforce	F19

Assign the second set of names individually, using the Range Name Create command. For example, to assign the name *reqd* to range C7..I7, press / (*Symph*: MENU) select Range Name Create, enter *reqd*, and specify cell C7..I7.

7. Formulas

Cell	***Formula***
F9	@SUM(reqd)/5
C13	+$wforce-C12

Copy cell C13 to range D13..I13.

Cell	***Formula***
J13	+C13
C14	@INT((C13+D13)/2)
C15	@IF(C14=J14,C14,@ROUND (@AVG(C14,J14),0))
D14	+D13-C14
D15	@IF($C$14=$J$14,D14,D13-C15)

Copy range D14..D15 to range E14. J15.

Cell	***Formula***
E16	+C17+1

Copy cell E16 to range F16..J16.

Cell	***Formula***
C17	@SUM($C$15..C15)

Copy cell C17 to range D17..I17.

Cell	***Formula***
F19	@SUM(staff)/5
B25	+B24+1

Copy cell B25 to range B26..B41.

Cell	***Formula***
C24	@IF(B24>=C$16#AND#B24<=C$17 #OR#B24>=J$16," xxx","")

Copy cell C24 to range C25..C41.

Cell	***Formula***
D24	@IF($B24>=D$16#AND#$B24< =D$17," xxx","")

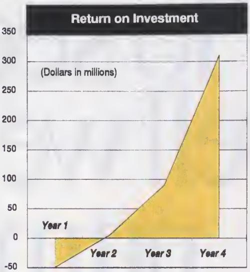
Copy cell D24 to range D24..I41.

To see how well we crunch numbers, look at our graphics.

Microsoft Excel for Windows.

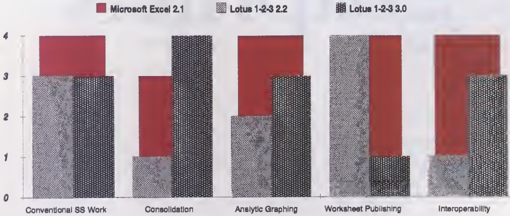
> *"With solid spreadsheet and charting components and a comprehensive macro language integrated into a powerful graphical environment, Excel is no more 'just a spreadsheet' than a Ferrari or a Porsche is 'just a car.'"* **PC Magazine**

Recently, *PC Magazine* placed Microsoft Excel version 2.10 head to head with Lotus 1-2-3 release 2.2 and 3. They measured the essential criteria by which spreadsheets are judged. As you can see from the chart, Microsoft Excel proved to be superior in its balance of capabilities. Further evidence of the advantages of the graphical-based Microsoft Excel over the character-based Lotus 1-2-3 can be seen in a recent study.



*Based on the findings of a recent study, switching to graphical applications can yield increased productivity and can result in these dollar savings. ****

Over the years, graphical-based applications result in significant dollar savings since they are faster to learn, faster to use and less frustrating to master.



In this chart, PC Magazine*** compares the salient spreadsheet criteria of Microsoft Excel and Lotus 1-2-3. As you can see, Microsoft Excel showed its superiority.*

(Incidentally, this report was created using Microsoft Excel linked with Microsoft Word for Windows.)

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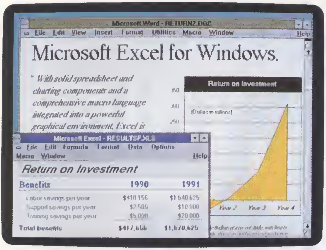
If you read the report at the left, you can see in just a couple of seconds how well Microsoft® Excel for Windows™ can crunch numbers.

Which is exactly our point.

Whatever analytic case you're making, it's much more easily made with a comprehensible, bottom-line report than with a row and column spreadsheet.


Microsoft Word - RETURN2.DOC
File Edit View Insert Format Utilities Macro Window Help
Microsoft Excel - RESULTSF.XLS
File Edit Formula Format Data Options Macro Window Help
Return on Investment
(Dollars in millions)
Year 2 Year 3 Year 4

Microsoft Excel for Windows.

" With solid spreadsheet and charting components and a comprehensive macro language integrated into a powerful graphical environment, Excel is

Return on Investment

Benefits	1990	1991
Labor savings per year	$410 156	$1 640 625
Support savings per year	$2 500	$10 000
Training savings per year	$5 000	$20 000
Total benefits	$417,656	$1,670,625

Windows can display Microsoft Excel and Word for Windows at the same time so you can see how all elements of your analysis will go together.

And that's not to give up one iota of analytic power.

Fact is, Microsoft Excel gives you more power to make sense of numbers than any other spreadsheet going. Simply because whether you're analyzing or reporting, you get the power of the Microsoft Windows environment every step of the way.

For instance, you can display multiple spreadsheets simultaneously. So you can see all your data and all the relationships at once.

If you want to link a couple of those spreadsheets, just point, click.

And consider it done.

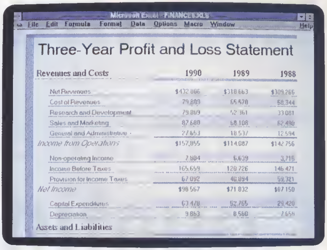
Or if you want to pull data from a variety of databases, you guessed it. Point, click and done.

Then before you wind up, you can do an audit of every formula to give you absolute confidence in your result.

And onto the finish. Which is where your results will really shine.

You can simply dress up your spreadsheet with color, shading, borders and a variety of type fonts.

Or you can chart your numbers hundreds of different ways to make them look really impressive.


Microsoft Excel - FINANCE.XLS
File Edit Formula Format Data Options Macro Window Help

Three-Year Profit and Loss Statement

Revenues and Costs	1990	1989	1988
Net Revenues	$432 806	$318 663	$309,266
Cost of Revenues	79 809	65 570	58,344
Research and Development	79 809	52 361	33 081
Sales and Marketing	87 680	68 108	62,490
General and Administrative	27 653	18 537	12 594
Income from Operations	$157,855	$114 087	$142 756
Non-operating Income	7 804	6,639	3,716
Income Before Taxes	165,659	120 726	146 471
Provision for Income Taxes	67 092	40 094	59,321
Net Income	$98 567	$71 832	$87 150
Capital Expenditures	63 470	52,765	29,420
Depreciation	9 863	8,560	7 658
Assets and Liabilities			

Under the Windows environment, WYSIWYG lets you see exactly how your work will print out while you're creating it.

Then when you want to pull out all the stops, you can easily create full-blown reports that mix text, graphics and data. Just copy and paste using other Windows applications, like Word for Windows.

And if you're starting to worry about change, don't. Microsoft Excel reads and writes Lotus® 1-2-3® files. So making a change for the better is easier done than said.

To prove it, we'll send you a free* fully functional Working Model of Microsoft Excel for Windows. Simply crunch these numbers: (800) 541-1261, Dept. M64.

That way you can see for yourself if our final analysis is correct.

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make sense *and Windows are trademarks of Microsoft Corporation Lotus and 1-2-3 are registered trademarks of Lotus Development Corporation* **The first Working Model you select is free during our Windows Computing Promotion, September 15 through*
*nunications Company ***"The Benefits of the Graphical User Interface" prepared Spring 1990, by Temple, Barker & Sloane, Inc*

Counting the Beans, While Counting the Beans

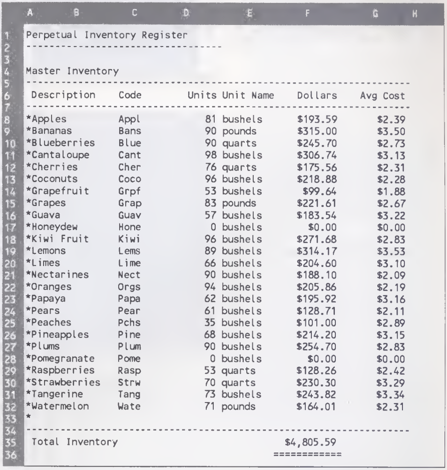
Simultaneously track inventory by units and by dollar value—without double-entry accounting.

BY STEPHEN L. NELSON

Marvin Gardener Jr., fresh out of business school, is ready to take over his dad's bustling fruit business, Fast Fruit Inc. But because of his dad's cigar-box method of record keeping, he can't tell how many boxes of peaches are on hand, how much the store paid for them, or even whether Fast Fruit is profitable.

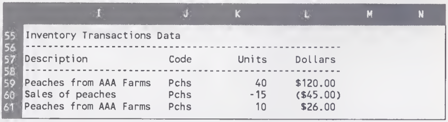
To get a handle on how he's doing, Marvin Jr. needs to track the amount of fruit bought and sold each day, the dollar value of the purchases and sales, and the total and unit values of the remaining inventory. Because Fast Fruit buys its stock at constantly varying prices, the average value of fruit on hand is always changing. Full-fledged accounting software, such as *Peachtree III* or *DacEasy*, would tell Marvin what he needs to know, but these are complicated double-entry systems, and Marvin isn't sure Fast Fruit needs formal double-entry accounting. On the other hand, simpler, less-expensive single-entry accounting tools, such as *Quicken*, track only the dollar value of inventory, not the units.

Fortunately, Marvin Jr. learned *1-2-3* at B-school. With the *1-2-3* worksheet described in this article, he can do the job simply and quickly, without buying any new software. This worksheet should help any business that wants to maintain and keep account of inventory in an environment where suppliers' prices fluctuate.



```
     A      B          C           D       E              F            G       H
 1   Perpetual Inventory Register
 2   --------------------------------
 3
 4   Master Inventory
 5   ------------------------------------------------------------------
 6    Description    Code          Units Unit Name      Dollars     Avg Cost
 7   ------------------------------------------------------------------
 8   *Apples         Appl             81 bushels       $193.59        $2.39
 9   *Bananas        Bans             90 pounds        $315.00        $3.50
10   *Blueberries    Blue             90 quarts        $245.70        $2.73
11   *Cantaloupe     Cant             98 bushels       $306.74        $3.13
12   *Cherries       Cher             76 quarts        $175.56        $2.31
13   *Coconuts       Coco             96 bushels       $218.88        $2.28
14   *Grapefruit     Grpf             53 bushels        $99.64        $1.88
15   *Grapes         Grap             83 pounds        $221.61        $2.67
16   *Guava          Guav             57 bushels       $183.54        $3.22
17   *Honeydew       Hone              0 bushels         $0.00        $0.00
18   *Kiwi Fruit     Kiwi             96 bushels       $271.68        $2.83
19   *Lemons         Lems             89 bushels       $314.17        $3.53
20   *Limes          Lime             66 bushels       $204.60        $3.10
21   *Nectarines     Nect             90 bushels       $188.10        $2.09
22   *Oranges        Orgs             94 bushels       $205.86        $2.19
23   *Papaya         Papa             62 bushels       $195.92        $3.16
24   *Pears          Pear             61 bushels       $128.71        $2.11
25   *Peaches        Pchs             35 bushels       $101.00        $2.89
26   *Pineapples     Pine             68 bushels       $214.20        $3.15
27   *Plums          Plum             90 bushels       $254.70        $2.83
28   *Pomegranate    Pome              0 bushels         $0.00        $0.00
29   *Raspberries    Rasp             53 quarts        $128.26        $2.42
30   *Strawberries   Strw             70 quarts        $230.30        $3.29
31   *Tangerine      Tang             73 bushels       $243.82        $3.34
32   *Watermelon     Wate             71 pounds        $164.01        $2.31
33   *
34   ------------------------------------------------------------------
35    Total Inventory                                $4,805.59
36                                                 ============
```

Figure 1. This master inventory list contains the number of units and the dollar value of inventory on hand. The formulas in column G compute the average value of each unit. The worksheet's macro makes it easy to update this table.



```
                  I                 J          K          L          M       N
55   Inventory Transactions Data
56   ----------------------------------------------------
57   Description               Code        Units     Dollars
58   ----------------------------------------------------
59   Peaches from AAA Farms    Pchs           40     $120.00
60   Sales of peaches          Pchs          -15     ($45.00)
61   Peaches from AAA Farms    Pchs           10      $26.00
```

Figure 2. The macro that updates the inventory list also creates this running list of transactions. The information can be erased as it becomes obsolete without affecting the master inventory list.

Suppose that, at the beginning of peach season, Fast Fruit buys 40 bushels of peaches at a total cost of $120, or $3 a bushel. There were no peaches on hand before this, so the store now holds $120 worth of peaches. The store sells 15 bushels the first day. Since each bushel is valued at $3, the store now has $75 worth of peaches left on hand. The next day Marvin purchases another 10 bushels at a total cost of $26. Fast Fruit now holds 35 bushels of peaches, with a total value of $101. The first 25 bushels were bought at $3 each, while the last 10 cost $2.60 each. The average value of peaches on hand is $2.89 a bushel. Any peaches sold that day are valued at that amount.

This model automatically tracks all the variables in the above example. A macro assists with the entry of purchases and sales and adjusts a listing of inventory accordingly. The worksheet runs in all versions of *1-2-3* and, with slight modifications, works in all versions of *Symphony*, as well. (See the setup box for details.) It can track several hundred different inventory items; the only limitation is computer memory.

To use the worksheet, start the macro and indicate whether you're recording purchases or sales. When recording purchases, the macro asks for a description of the transaction, an item code, the number of units purchased, and the total cost of the purchase. It then posts these values to the inventory table shown in figure 1 and adds the number of units and the cost to the values in columns D and F. The formula in column G, which divides the value of stock on hand by the number of units on hand, returns an updated per-unit value.

When recording sales, the macro elicits a description of the transaction, an item code, and the number of units sold. The macro always makes units sold a negative number that will decrease the number of units on hand when it's posted to the inventory. Instead of asking for the total value of the sale, the macro computes that amount by looking up the per-unit cost from the inventory list and multiplying that by the number of units sold. It then adjusts the amounts on hand in the inventory list to reflect the reduction of stock.

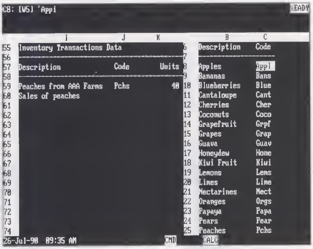
To make it easier to enter item codes, the macro gives you the option of pressing the Return key to display a list of valid codes. Select a code by highlighting it and pressing Return again.

Buying and Selling Peaches

When you first set up the worksheet, all the unit and dollar amounts will be zero, and there will be no entries in the transactions area. Don't bother to set up a starting inventory until you adapt the model for your own business.

To see how to use the model, enter a sample sales transaction for peaches. Hold down the MACRO key (Alt on most computers) and press T (for transactions, and thus the macro name \t). The cell pointer moves to cell I59, and the control panel displays a menu with two choices: Purchase and Sales. Select Purchase and the control panel displays the prompt *Enter description (up to 25 chars).* Enter the characters *Peaches from AAA Farms.* What you enter as a description for the transaction isn't critical, so use whatever you think might be helpful. The characters you typed appear in cell I59, and the cell pointer moves to the right.

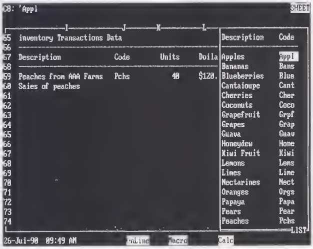
Now you see the prompt *Enter code <Press Return for a list>.* Because you don't know the code, press Return. A window containing the names and codes for the various kinds of fruit appears at the right side of the screen, as shown in figure 3 (figure 4 for *Symphony*). Move the cell pointer down until the label *Pchs* is highlighted and then press Return. This copies the code to the cell named *tmp_code* and to cell J59. The code list disappears, and again the cell pointer moves to the right.



```
C8: [W5] 'Appi                                                      READY


              I                 J          K            B             C
55 Inventory Transactions Data                    6  Description    Code
56 -------------------------------------------    7  -------------------
57 Description               Code       Units     8  Apples         Appl
58 -------------------------------------------    9  Bananas        Bans
59 Peaches from AAA Farms    Pchs          40     10 Blueberries    Blue
60 Sales of peaches                               11 Cantaloupe     Cant
61                                                12 Cherries       Cher
62                                                13 Coconuts       Coco
63                                                14 Grapefruit     Grpf
64                                                15 Grapes         Grap
65                                                16 Guava          Guav
66                                                17 Honeydew       Hone
67                                                18 Kiwi Fruit     Kiwi
68                                                19 Lemons         Lems
69                                                20 Limes          Lime
70                                                21 Nectarines     Nect
71                                                22 Oranges        Orgs
72                                                23 Papaya         Papa
73                                                24 Pears          Pear
74                                                25 Peaches        Pchs
26-Jul-90  09:35 AM                        CMD       CALC
```

Figure 3. The macro helps ensure correct item codes by creating a window containing a list of all valid codes. Select a code by highlighting it and pressing Return.



```
C8: 'Appl                                                              SHEET


 -------------I--------------J---------K----------L--
55 inventory Transactions Data                      Description    Code
56 ------------------------------------------------ ------------------
57 Description               Code       Units  Doila Apples         Appl
58 ------------------------------------------------ Bananas        Bans
59 Peaches from AAA Farms    Pchs          40  $120. Blueberries    Blue
60 Saies of peaches                                 Cantaioupe     Cant
61                                                  Cherries       Cher
62                                                  Coconuts       Coco
63                                                  Grapefruit     Grpf
64                                                  Grapes         Grap
65                                                  Guava          Guav
66                                                  Honeydew       Hone
67                                                  Kiwi Fruit     Kiwi
68                                                  Lemons         Lems
69                                                  Limes          Lime
70                                                  Nectarines     Nect
71                                                  Oranges        Orgs
72                                                  Papaya         Papa
73                                                  Pears          Pear
74                                                  Peaches        Pchs
                                                    ==========LIST
26-Jui-90  09:49 AM          OnLine    Macro        Calc
```

Figure 4. This is how the *Symphony* version of the template looks as it displays a list of item codes. The small window is a permanent part of the worksheet that's normally hidden by the MAIN window.

The prompt in the control panel now reads *Enter units purchased or sold in bushels.* Enter *40.* The cell pointer moves to the right, and the prompt reads *Enter purchase amount.* Enter *120.* The macro adds 40 to the value 0 in cell D25 and adds 120 to the value 0 in cell F25. Then it moves the cell pointer back to cell I59 and down one cell. Again, the macro prompts you for a description of the next purchase. You can continue entering purchase transactions or hit Return to end the macro and move the pointer back to cell A1. Once you end the macro, pressing PageDown shows that the unit and dollar amounts for peaches are now 40 and $120, respectively. The formula in cell G25 returns $3, the average per-bushel cost of peaches in inventory.

To enter a sales transaction, press MACRO-T, then select Sales from the menu. The cell pointer moves to cell I60 and the *Enter description* prompt appears. Enter *Sales of peaches.* The cell pointer moves to the right and the prompt *Enter code* appears. Since you now know the code for peaches is *Pchs,* enter that. (It doesn't matter how you capitalize your entry.) The macro places the code in a cell named *tmp_code* and uses an @VLOOKUP formula to find the entry in column C that matches the label you entered. If you enter a label that doesn't appear in the list of codes, the screen displays an error message. Press any key to clear the message and return to the code prompt. If you entered a valid code, the macro copies the corresponding code from the inventory table to *tmp_code,* then copies *tmp_code* to the current cell.

Once the macro has copied the item code to the appropriate cells, it clears the windows, moves the cell pointer to the right, and displays the *Enter units* prompt. Enter *15*. The macro converts the entry to *–15*, then computes the value of 15 bushels of peaches by looking up the average price per bushel (cell G25) and multiplying that amount by the number of bushels sold. The result is –$45, which appears in cell L60. The cell pointer moves back to column I and down a row. Pressing Return ends the macro.

To see how the model updates the average unit cost of inventory, enter another purchase transaction. Press MACRO-T and select Purchase. Enter a description, the code *pchs*, *10* at the *Enter units* prompt, and *26* at the purchase-amount prompt. Press Return to end the macro. Then press PageDown. Row 25 now indicates 35 bushels of peaches on hand at an average cost of $2.89 per bushel.

In the Real World

It's easy to adapt this model for your own business, no matter what items you need to track. Simply replace the descriptions, codes, and unit names in columns B, C, and E with your own terms. If you need more room, add new rows to the worksheet between rows 32 and 33 and copy the formula in cell A32 into the newly created rows. Make sure that the last cell in column A (before the first row of dashes) still contains the value 1.

If you have fewer than 25 codes in your inventory list, do not delete any rows because this may corrupt the macros. Instead, Enter '---- (an apostrophe followed by four hyphens) in the cell below the last code in column C and copy this label into the remaining cells down to cell C32. (Be careful not to overwrite the hidden @ERR in cell C33.) Then erase the accompanying entries in columns B and D through G.

This template should simplify your inventory process, but a few quick tips will make it even easier. When you begin

ABOUT THE MACRO

This inventory worksheet uses a macro, invoked by holding down the MACRO key and pressing T, to help users enter the transactions that adjust inventory levels. The macro is shown in figure 5. A few subroutines, a menu, and some cells in which the macro temporarily stores entries are shown in figure 6.

Although a bit long, the macro is actually fairly simple. It prompts the user for four pieces of information and copies each entry to the current cell. It uses the {PUT} command to add values to the inventory list.

In a few places, though, the macro takes relatively unusual approaches. For instance, the instruction in cell O7 determines if the user pressed Return at the code prompt. If so, the instruction calls the subroutine *helper*. This subroutine creates a vertical window in the *1-2-3* worksheet, unsynchronizes the windows, and moves the cell pointer to the new window. It then clears the worksheet titles for the window, brings the list of descriptions and codes to the window, and sets new worksheet titles. Next, it allows the user to move the cell pointer and waits for the user to press Return again. When this happens, it copies the current cell to *tmp_code* and to the cell that was highlighted before the *helper* routine was called. Finally, the *helper* routine clears the window, moves the cell pointer to the right, and ends. The *t* macro resumes control immediately after the subroutine call and branches directly to the *getunit* routine.

The *Symphony* version of *helper* is much simpler because the model contains a permanent window, which is normally hidden behind the MAIN window. All the routine must do to call up the list of codes is execute the instruction {*WINDOW*}.

If the user enters characters at the code prompt instead of using the help option, *t* uses the instructions in cells O8 and O9 to confirm that the code is valid. Cell O8 recalculates the range *codelist*, which includes the formulas in column A (they appear as asterisks in figure 1), the descriptions in column B, and the codes in column C. For each row, the formula in column A returns 1 if the code in the same row equals the label in *tmp_code*. For example, the formula in cell A8 is +C8=$tmp_code. Two labels are equal if they contain the same letters; the cases of the letters do not have to match. So, if the label in *tmp_code* is *pchs*, only the formula in cell A25 returns 1 (because *pchs* is equal to *Pchs*). The remaining formulas in column A return 0.

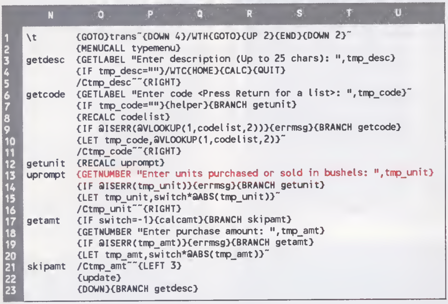
To verify the entry, cell O9 uses the logic formulas in column A to find the matching code, which is indicated by a 1. This eliminates the need to screen entries for the correct capitalization.

Assuming that the entry in *tmp_code* matches one of the codes in column C, the result of the lookup will not be ERR, so the macro proceeds to the instruction in cell O10. The last row of *codelist* contains the value 1 in cell A33 and @ERR in cell C33. Cell C33 is hidden. If the label in *tmp_code* does not match one of the codes, all the formulas in range A8..A32 return zeros, so the lookup returns ERR. When this happens, cell O9 calls the routine *errmsg* (cell Y26 in figure 6).

The instruction in cell O10 changes the entry in *tmp_code* to one that exactly matches the corresponding code from column C. This way, *tmp_code* can be used in @VLOOKUP formulas in the rest of the macro.

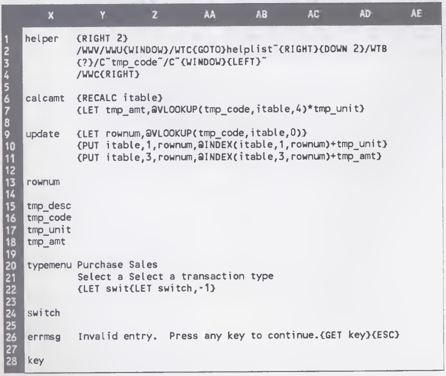
The instruction in cell O13 is not a label but a formula that returns a string. One of its expressions looks up the unit name that corresponds to the code entered. It controls the prompt that asks for the number of units. Purchases of cherries, for instance, cause the instruction in cell O13 to display the prompt *Enter units purchased or sold in quarts*.

Everything else in the macro and subroutines is pretty straightforward. The commands {GETLABEL}, {GETNUMBER}, {IF}, {LET}, {PUT}, {RECALC}, and {BRANCH} are explained in detail in the documentation for *1-2-3* and *Symphony*.



```
     N          O          P          Q          R          S          T          U
1   \t        {GOTO}trans~{DOWN 4}/WTH{GOTO}{UP 2}{END}{DOWN 2}~
2             {MENUCALL typemenu}
3   getdesc   {GETLABEL "Enter description (Up to 25 chars): ",tmp_desc}
4             {IF tmp_desc=""}/WTC{HOME}{CALC}{QUIT}
5             /Ctmp_desc~~{RIGHT}
6   getcode   {GETLABEL "Enter code <Press Return for a list>: ",tmp_code}~
7             {IF tmp_code=""}{helper}{BRANCH getunit}
8             {RECALC codelist}
9             {IF @ISERR(@VLOOKUP(1,codelist,2))}{errmsg}{BRANCH getcode}
10            {LET tmp_code,@VLOOKUP(1,codelist,2)}~
11            /Ctmp_code~~{RIGHT}
12  getunit   {RECALC uprompt}
13  uprompt   {GETNUMBER "Enter units purchased or sold in bushels: ",tmp_unit}
14            {IF @ISERR(tmp_unit)}{errmsg}{BRANCH getunit}
15            {LET tmp_unit,switch*@ABS(tmp_unit)}~
16            /Ctmp_unit~~{RIGHT}
17  getamt    {IF switch=-1}{calcamt}{BRANCH skipamt}
18            {GETNUMBER "Enter purchase amount: ",tmp_amt}
19            {IF @ISERR(tmp_amt)}{errmsg}{BRANCH getamt}
20            {LET tmp_amt,switch*@ABS(tmp_amt)}~
21  skipamt   /Ctmp_amt~~{LEFT 3}
22            {update}
23            {DOWN}{BRANCH getdesc}
```

Figure 5. The \t macro makes it easy to log in purchase and sales transactions and to post them to the master inventory list. The entry in cell O13 is a string-returning formula. It presents a prompt that tells which unit of measurement to use when entering quantities.



```
     X          Y          Z          AA         AB         AC         AD         AE
1   helper    {RIGHT 2}
2             /WWV/WWU{WINDOW}/WTC{GOTO}helplist~{RIGHT}{DOWN 2}/WTB
3             {?}/C~tmp_code~/C~{WINDOW}{LEFT}~
4             /WWC{RIGHT}
5
6   calcamt   {RECALC itable}
7             {LET tmp_amt,@VLOOKUP(tmp_code,itable,4)*tmp_unit}
8
9   update    {LET rownum,@VLOOKUP(tmp_code,itable,0)}
10            {PUT itable,1,rownum,@INDEX(itable,1,rownum)+tmp_unit}
11            {PUT itable,3,rownum,@INDEX(itable,3,rownum)+tmp_amt}
12
13  rownum
14
15  tmp_desc
16  tmp_code
17  tmp_unit
18  tmp_amt
19
20  typemenu Purchase Sales
21            Select a Select a transaction type
22            {LET swit{LET switch,-1}
23
24  switch
25
26  errmsg    Invalid entry.  Press any key to continue.{GET key}{ESC}
27
28  key
```

Figure 6. These labels comprise subroutines, reference cells, and a macro used by the \t macro, which is shown in figure 5.

using it, you can input your starting inventory directly into the inventory table or enter it via the macro as a purchase transaction. Use a phrase, such as *Starting balance*, at the description prompt. If you're not sure of the values of the items in your starting inventory, you'll have to estimate. Try to pick a reasonable value, such as the number of units times either the most recent cost or the average cost during the last year.

Save time by batching inventory transactions together to enter several in one session. For example, collect the paperwork describing purchase and sales transactions throughout the day and enter them all at the end of the day or first thing the next morning. Remember to enter the purchase transactions first, because they determine the value of stock sold.

Keep in mind that even if you faithfully record every transaction, inventory records gradually become inaccurate due to shrinkage from theft, spoilage, breakage, and other factors. Conduct physical inventory counts on a regular basis and compare the results to the figures listed in the worksheet. Then adjust the inventory list, using the macro and entering reductions in numbers of units as sales transactions. Remember that the macro automatically determines the value of the unit taken out of inventory.

Finally, although the worksheet that updates the inventory keeps a running list of transactions, as shown in figure 2, the inventory list does not depend on these entries. Periodically, you may want to remove these transactions from the worksheet. Press GOTO and enter *trans*. Then erase all the entries in columns I through L, beginning below the second row of dashes.

As important as it is to keep track of quantities on the shelves or in the storeroom, the value of the materials is also crucial for analyzing a business's profitability. This template makes day-to-day operations a bit simpler by keeping tabs on both at once. ■

Stephen L. Nelson is a consultant in Seattle and the author of *The Lotus 1-2-3 Money Manager*, published by Microsoft Press.

The model in this article can be downloaded from CompuServe. For more information, see the box on page 4.

HOW TO SET UP THE INVENTORY REGISTER WORKSHEET

1. Releases

This worksheet works in *1-2-3* Releases 2.01, 2.2, and 3, and in *Symphony* Releases 2.0 and 2.2

2. Default settings

Recalculation: Manual

1-2-3: /Worksheet Global Recalculation Manual

Symph: MENU Settings Recalculation Method Manual Quit

Format: Currency 2

1-2-3: /Worksheet Global Format Currency, press Return

Symph: MENU Settings Format Currency, press Return, select Quit

3. Column widths

Column	***Width***
A	1
B	15
C	5
D	13
F	12
G	12
H	1
I	26
J	6
K	12
L	12

For example, to set the width of column A, place the cell pointer in column A, select /Worksheet Column Set-Width (*Symph:* MENU Width Set), and enter *1*.

4. Cell formats

Format	***Range***
General	D8..D32, Y17
Hidden	C33
(*Symph:* Other Hidden)	

For example, to assign the General format to range D8..D32, select /Range Format General (*Symph:* MENU Format General) and specify range D8..D32.

5. Labels

Enter the labels shown in figure 1. To create rows of dashes or equal signs, enter \– or \=. Do not enter the asterisks shown in column A or any of the values shown. Begin the labels in cells D6, F6, and G6 with quotation marks.

Enter the labels shown in rows 55 to 58 of figure 2. Begin the labels in cells K57 and L57 with quotation marks.

Enter the labels shown in figure 5, but do not enter a label in cell O13. Begin each of the labels shown in cells N1, O5, O11, O26, and O31 with an apostrophe. In *Symphony* use the following labels in column O.

01	Replace	*/WTH* with *{MENU}STHQ*
04	Replace	*/WTC* with *{MENU}STCQ*
05	Replace	/ with *{MENU}*
011	Replace	/ with *{MENU}*
016	Replace	/ with *{MENU}*
021	Replace	/ with *{MENU}*

Enter the labels shown in figure 6. Begin each label shown in cells Y2 and Y4 with an apostrophe. In *1-2-3* Release 3 omit the characters *{RIGHT}* in cell Y4. In *Symphony* leave cell Y4 empty and replace the labels shown in range Y1..Y3 with:

Y1	{WINDOW}{HOME}
Y2	{?}{MENU}C~tmp_code~ {MENU}C~{WINDOW}~
Y3	{WINDOW}{RIGHT}

In both *1-2-3* and *Symphony*, enter *Purchase* in cell Y20 and *Sales* in cell Z20. Enter *Select a transaction type* in cell Y21 and copy cell Y21 to cell Z21. Then enter *{LET switch,1}* in cell Y22 and enter *{LET switch,–1}* in cell Z22.

6. Values

Enter *0* in cell D8 and copy cell D8 to range D9..D32. Enter *0* in cell F8 and copy cell F8 to range F9..F32. It is not necessary to enter the values shown in columns D and F of figure 1. Enter *1* in cell A33.

7. Range names

Name	***Range***
codelist	A8..C34
itable	C8..G37
trans	I55
helplist	B6

For example, to assign the name to range A8..C34, press / (*Symph:* MENU), select Range Name Create, enter *codelist*, and specify range A8..C34.

\t	01
getdesc	03
getcode	06
getunit	012
uprompt	013
getamt	017
skipamt	021
helper	Y1
calcamt	Y6
update	Y9
rownum	Y13
tmp_desc	Y15
tmp_code	Y16
tmp_unit	Y17
tmp_amt	Y18
typemenu	Y20
switch	Y24
errmsg	Y26
key	Y28

To assign these range names, press / (*Symph:* MENU), select Range Name Labels Right, and specify range N1..N21. Then press / (*Symph:* MENU), select Range Name Labels Right, and specify range X1..X28.

8. Cell formulas

Cell	***Formula***
A8	+C8=$tmp_code

Copy cell A8 to range A9..A32. These formulas display *.

G8	@IF(D8,F8/D8,0)

Copy cell G8 to range G9..G32. These formulas initially return *0*.

C33	@ERR
F35	@SUM(F7..F34)
O13	+"{GETNUMBER ""Enter units purchased or sold in "&@VLOOKUP (Y16,G8..G37,2) & ":"",tmp_unit}"

The formula in cell O13 initially returns ERR.

9. Windows (*Symphony* only)

Select SERVICES Window Create and enter *LIST*. Select SHEET. To set the size of the window, press Tab twice, hold down the Control key and press the RightArrow key seven times, and then press Return. Select Borders Line, select Restrict Range, and specify range B6..C32. Select Quit. Move the cell pointer down two rows and right one column. Finally, select MENU Settings Titles Both Quit. Press the WINDOW key (F6 on most computers) to get the cell pointer back to the MAIN window.

10. Save the file

To save the template with its formulas intact, select /File Save (*Symph:* SERVICES File Save), type a file name that isn't already listed in the default directory, and press Return.

Answers to Your Questions About Lotus Products

1-2-3 / Symphony

Find ERRs in database

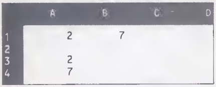
Q Is there a criterion formula that will locate ERRs within a database? I have a column of more than 1,800 values. When I try to find the average and the standard deviation of these values, the formulas return ERR. I want to use the Query Find command to locate the ERRs but don't know how to write the criterion formula.

Alan Foster
Baylor Health Care System
Dallas, Tex.

A Use the @ISERR function in the criterion formula. The formula @ISERR(A2) returns 1 if cell A2 contains ERR, 0 if cell A2 contains anything except ERR. If cell A2 is the first cell that contains data in your database, then the formula @ISERR(A2) in the appropriate cell of the Criterion range will match any records that contain ERR in column A.

Once is not enough

Q I created a spreadsheet that contains only two formulas, yet I must press the CALC key twice to recalculate it. The spreadsheet appears as follows:



	A	B	C	D
1	2	7		
2				
3	2			
4	7			

I entered the value *2* into cells A1 and A3. Then I entered the formula +5+A3 into cell A4 and entered the formula @@("A"&@STRING(2*A1,0)) into cell B1. I set the recalculation method to Manual and the order to Natural. Each time I change the entry in cell A3 and press the CALC key, the results of the formulas in cells A4 and B1 change accordingly. But after I save and retrieve the file, change the entry in cell A3, and press CALC, the formula in cell A4 recalculates, but the formula in cell B1 doesn't. I must press CALC again for the formula in cell B1 to evaluate to the correct results. Why does this happen?

Jon Frye
Continental Bank
Chicago, Ill.

A The behavior of the @@ function causes this to happen. The formula @@(*location*) returns the contents of the cell that is specified in *location*. Your @@ function contains a string formula that refers to cell A1 but evaluates to the contents of cell A4. When that formula calculates, the resulting string *4* is concatenated with the string *A* to form the cell address *A4*. The @@ formula then refers to cell A4 to determine its contents.

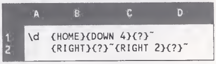
With recalculation set to Natural, before *1-2-3* or *Symphony* recalculates a formula, the spreadsheet recalculates any other formulas on which that formula depends. The software doesn't consider cell A4 when it determines the calculation order of the @@ function, because A4 is actually a string, not a cell address. Rather, it bases calculation order on the reference to cell A1. Although the @@ formula may appear to be linked to cell A4, it is really linked to cell A1. *1-2-3* and *Symphony* must first resolve any "live," or nonstring, formulaic references in the @@ function.

When you press CALC, *1-2-3* resolves the @@ function's reference to cell A1 before it updates the entry in cell A4. Pressing CALC a second time brings the @@ function up to date.

It is certainly possible to create spreadsheets complicated enough to require several recalculations. However, unless you have designed it otherwise, a spreadsheet will resolve its formulas in a single calculation. If your formulas don't keep up with the recalculations, back up and look for errors in your reasoning.

Data entry out of sync

Q We use the following macro to perform data entry:



	A	B	C	D
1	\d	{HOME}{DOWN 4}{?}~		
2		{RIGHT}{?}~{RIGHT 2}{?}~		

Sometimes the data-entry operator makes a mistake on the first entry but doesn't realize it until working on the second cell. Using the cursor keys to move left and modify the first entry without stopping the macro puts the macro out of sync with incoming data.

Can I restrict or disable the pointer-movement keys during macro execution?

Ted Van Grootheest
Office of the County Assessor
Storm Lake, Iowa

A There are two methods to solve the problem you describe. The first one, the Range Input command, restricts movement of the cell pointer to unprotected cells in a specified range. Unlike your macro, the Range Input command won't move the cell pointer to each cell in turn, but it will restrict the cell pointer to the cells you specify

To see how the Range Input command works, unprotect cells A5, B5, and D5. Press slash and select Range Unprotect (in *Symphony*, press MENU and select Range Protect Allow-Changes) and indicate range A5..B5. Follow the same steps to unprotect cell D5.

If you use *Symphony*, make sure the Input add-in is attached. Select SERVICES Application Attach, select INPUT.APP from the resulting menu, and then select Quit. If INPUT.APP doesn't appear as an option, the necessary file isn't on your hard disk in the directory that holds *Symphony*'s program files (or on the disk in drive A if you're running *Symphony* from a floppy disk). Make sure the Input add-in is available and then reissue the commands.

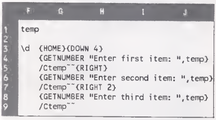
Next, issue the Range Input command. Press slash (in *Symphony*, MENU), select Range Input, and indicate range A1..D6. The cell pointer jumps to cell A5. Type some characters and press Return. Then press the RightArrow key, make another entry, and press the RightArrow key once more. The cell pointer jumps from cell B5 to cell D5. Make an entry in cell D5, or use the Arrow keys to move back to column A or B. No matter what cursor-movement keys you press, the cell pointer moves only to cells A5, B5, and D5. To end the Range Input command, press Return or Escape when *1-2-3* is in Ready mode (SHEET mode in *Symphony*).

When a macro processes a Range Input command, the command takes control, as it does when you issue the command manually. Only after you end the Input command does the macro resume control.

If you want the macro to allow you to enter data in subsequent rows of columns A, B, and D, unprotect the cells in those rows and include them in the Range Input range. To restrict data entry to one row at a time, your macro can unprotect the necessary cells in each row in turn and then reprotect the cells after the data is entered.

An alternative method uses the {GETLABEL} and {GETNUMBER} macro commands to disable the pointer-movement keys. These commands display a prompt in the control panel and wait for data entry. When you enter data in response to the prompt, the {GETLABEL} command stores your entry as a label in a specified location. The {GETNUMBER} command stores your entry as a value in a specified location.

The following worksheet shows a macro that uses {GETNUMBER} commands to solve the problem you've described.



```
     F    G             H             I             J
1  temp
2
3  \d   {HOME}{DOWN 4}
4       {GETNUMBER "Enter first item: ",temp}
5       /Ctemp~~{RIGHT}
6       {GETNUMBER "Enter second item: ",temp}
7       /Ctemp~~{RIGHT 2}
8       {GETNUMBER "Enter third item: ",temp}
9       /Ctemp~~
```

To create the macro, enter the labels shown in the figure. Precede the labels in cells F3, G5, G7, and G9 with a label prefix. Then use the Range Name Labels Right command to assign the labels in range F1..F3 as names for the adjacent cells of column G. If you use *Symphony*, replace the slash in cells G5, G7, and G9 with {MENU}.

To use the macro, hold down the MACRO key (Alt on most computers) and press D. The cell pointer jumps to cell A5, and the prompt *Enter first item* appears in the control panel. Type a value, press Return, and the cell pointer moves to the right. A new prompt appears in the control panel. Pressing a pointer-movement key has no effect on the worksheet.

When you enter a value in response to this prompt, the cell pointer moves two cells to the right and another prompt appears. Type your final entry, press Return, and the macro ends.

Here's how the macro works:

{HOME}{DOWN 4} moves the cell pointer to cell A5.

{GETNUMBER "Enter first item: ",temp} prompts you to enter data and stores your entry as a value in the cell named *temp*. If you enter a label instead of a number, {GETNUMBER} stores ERR in *temp*.

/Ctemp~~{RIGHT} copies the data in *temp* to the current cell, then moves the cell pointer to the right.

{GETNUMBER "Enter second item: ", temp} prompts you for another entry and stores it in *temp*, replacing the previous entry.

/Ctemp~~{RIGHT 2} copies the contents of *temp* to the current cell and moves the cell pointer two cells to the right.

{GETNUMBER "Enter third item: ",temp} prompts you for the final entry and stores it in *temp*.

/Ctemp~~ copies the last entry from *temp* to the current cell.

The macro commands in range G4..G9 let you enter data into any row of the worksheet. If you need to enter data into subsequent rows, add the commands {LEFT 3}{DOWN} to the end of the macro and reuse them by instructing the macro to branch back to cell G4. You can customize the prompts in your macro by replacing the quoted string in each {GETNUMBER} command with a phrase relevant to your application. If you add a loop to the macro, end the macro by holding down the Control key and pressing Break.

Calculate a commission

Q Why does the expression (A1>=100000)*4500 return 4,500 when cell A1 is greater than 100,000 and 0 when cell A1 is less than 100,000? This expression appeared in an @IF formula in your answer to Bob Carr in the April issue (page 80).

James M. Hopkins
Morningside College
Sioux City, Iowa

A The key to the expression is Boolean logic. It's a system of representing with numbers the idea that if something isn't true, then it's false, and if something isn't false, then it's true. In Boolean logic, the only result of an expression is 0 or 1. A 0 represents *false*, and a 1 represents *true*.

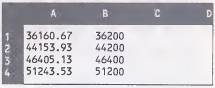
To understand this concept, consider the mathematical expression 7>3. It means "seven is greater than three." The statement is true. If you enter this as a formula in the spreadsheet, it returns 1. The expression 7<3, which means "seven is less than 3," is false. It returns 0 if you enter it in the spreadsheet.

Our formula used the expression (A1>=100000)*4500. Using Boolean logic, this means "when cell A1 is greater than or equal to 100,000, multiply 4,500 times 1. When cell A1 is less than 100,000, multiply 4,500 times 0."

You may want to refer to the August issue (page 60, "Calculate a commission"), where we ran two formulas that were shorter and less complex than the original formula, which appeared in April.

Round above the decimal

Q Is there a macro that will round the values shown in column A of the figure so that they result in the values shown in column B? We have been rounding the values manually.



	A	B	C	D
1	36160.67	36200		
2	44153.93	44200		
3	46405.13	46400		
4	51243.53	51200		

Carol Prosje
Hamilton RV Centre Ltd.
Hamilton, Ontario

A The @ROUND function can handle this problem. The formula @ROUND(*x*,*n*) rounds the value *x* to *n* decimal places. The argument *n* can be a value from 15 to -15 (100 to -100 in *1-2-3* Release 3). When *n* is positive, the @ROUND function rounds to the right of the decimal point. When *n* is negative, it rounds to the left of the decimal point, and when *n* is zero, it rounds to an integer. For example, when *n* is -2, the function rounds to the nearest hundred, and when *n* is -3, it rounds to the nearest thousand.

Enter the formula @ROUND(A1,-2) into

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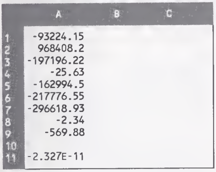
cell B1 and copy it to range B2..B4. If you want to replace the values in column A with the rounded values, select /Range Value (in *Symphony*, MENU Range Values), indicate the formulas in column B as the range to copy from, and indicate cell A1 as the range to copy to. Then erase the formulas in column B.

Why scientific format?

Q I entered a list of numbers in range A1..A9 and then summed them in cell A11. With a default format of General and a column width of 11, my spreadsheet still displays the result in scientific notation. What's going on?



```
     A            B         C
1   -93224.15
2    968408.2
3  -197196.22
4      -25.63
5   -162994.5
6  -217776.55
7  -296618.93
8       -2.34
9     -569.88
10
11 -2.327E-11
```

Timothy W. Tolley
Drumstick Company
Columbus, Ohio

A This problem is due to floating-point arithmetic.

1-2-3 Releases 1A/2/2.01/2.2 and all releases of *Symphony* maintain accuracy to 15 decimal places. *1-2-3* Release 3 maintains accuracy to 18 decimal places. However, to calculate efficiently, floating-point algorithms may create extremely small errors far to the right of the decimal point. These tiny errors sometimes crop up in calculations, creating inequalities between numbers that should be equal and returning a very small value for a number that should be zero.

The values in range A1..A9 of your spreadsheet add up to zero. However, in summing those values, your spreadsheet arrives at a very small number that is almost zero but that has a nonzero digit in the eleventh or twelfth decimal place. The only way your spreadsheet can express such a small value is to resort to scientific notation.

You can eliminate the error in your spreadsheet by enclosing the @SUM formula in an @ROUND function. Replace the formula that is in cell A11 with the formula @ROUND(@SUM(A1..A9),2).

Contest

August contest results

The August contest asked readers to suggest a formula or formulas that would convert a value into a string in Comma format with zero decimal places. For example, if cell A1 contains the value 108108, the final formula should return the string 108,108. If cell A1 contains the value 108108108, the final formula should return 108,108,108.

Some formulas work for only 6- to 9-digit values, some work for values of up to 15 digits, and some work for values of up to 18 digits. Because we didn't specify the number of digits for which the winning solution must work, we selected the best entries in each category. We looked at every entry we received.

Some entries were macros. We disqualified these because we specifically asked for a formula or formulas. Most of the entries work, but the shortest formulas came out on top.

Bob Stager of Camp Hill, Pa., created the most concise solution. His 96-character formula works for 6- and 9-digit values. The value to be converted is in cell A1, and the following formula is entered in any other cell:

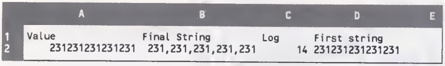
```
@IF(A1>999999,@REPLACE (@REPLACE
(@STRING(A1,0),3,0,",")‚7,0,","),
  @REPLACE(@STRING(A1,0),3,0,","))
```

Roland Karsch of St. Charles, Ill., submitted the following 171-character formula for values of up to 12 digits. Cell A1 contains the value to be converted:

```
@IF(A1<10^9,"",@STRING
 (A1/10^9–0.5,0)&",")&
 @IF(A1<10^6,"",@RIGHT
 (@STRING(A1/10^6–0.5,0),
 3)&",")&@IF(A1>999,@RIGHT
 (@STRING(A1/1000–0.5,0),
 3)&",","")&@RIGHT
 (@STRING(A1,0),3)
```

William Barney of Appleton, Wis., submitted a series of formulas that works for values of up to 15 digits. Mr. Barney's 227-character solution handles positive and negative numbers. Removing the negative test reduces it to 175 characters.

Mr. Barney stated that the formulas could be combined into one cell but that he prefers to place formula segments that



	A	B	C	D	E
1	Value	Final String	Log	First string	
2	231231231231231	231,231,231,231,231	14	231231231231231	

are repeated in their own cells and reference them in the main formula. If the segments were combined into one cell, the resulting formula might exceed the maximum number of characters allowed in a single cell (240 characters in *Symphony* and *1-2-3* Release 2.*x* and earlier; 512 characters in *1-2-3* Release 3.*x*). See the figure above for his method.

Cell A2 contains the value, and cell B2 contains the following formula:

```
@REPEAT(“ ”,18–C2–@INT(C2/3))&
  @IF(A2<=–0.5,“–”,“ ”)&
  @RIGHT(@REPLACE(@REPLACE
  (@REPLACE(@REPLACE
  (D2,12,0,“,”),9,0,“,”),6,0,“,”),3,0,“,”),
  C2+1+@INT(C2/3))
```

Cell C2 contains the following formula:

```
@IF(@ABS(A2)<1,0,@INT(@LOG
  (@ABS(A2))))
```

Cell D2 contains the following formula:

```
@REPEAT(“ ”,14–C2)&@STRING
(@ABS(A2),0)
```

This solution can be shortened by removing the negative test. Cell A2 contains the value, and cell B2 contains the following formula:

```
@REPEAT(“ ”,18–C2–@INT
  (C2/3))&@RIGHT(@REPLACE
  (@REPLACE(@REPLACE
  (@REPLACE(D2,12,0,“,”),
  9,0,“,”),6,0,“,”),3,0,“,”),
  C2+1+@INT(C2/3))
```

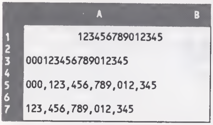
Cell C2 contains the following formula:

```
@INT(@LOG(A2))
```

Cell D2 contains the following formula:

```
@REPEAT(“ ”,14–C2)&@STRING(A2,0)
```

In the 18-digit category, there are two winners. Roger S. Whiting of Champaign, Ill., submitted a three-formula, 218-character solution that works for values of up to 18 digits in *1-2-3* Release 3.*x* and for values of up to 15 digits in *Symphony* and *1-2-3* Release 2.*x* and earlier. Cell A1 in the figure at the bottom of the adjacent column contains the value.



	A	B
1	123456789012345	
2		
3	000123456789012345	
4		
5	000,123,456,789,012,345	
6		
7	123,456,789,012,345	

Cell A3 contains the following formula:

```
@REPEAT(“0”,18–@LENGTH
  (@STRING(A1,0)))&@STRING(A1,0)
```

Cell A5 contains the following formula:

```
@LEFT(A3,3)&“,”&@MID(A3,3,3)
  &“,”&@MID(A3,6,3)&“,”&
  @MID(A3,9,3)&“,”&@MID
  (A3,12,3)&“,”&@MID(A3,15,3)
```

Cell A7 contains the following formula:

```
@RIGHT(A5,@LENGTH(@STRING
  (A1,0))+@INT((@LENGTH
  (@STRING(A1,0))–1)/3))
```

Jeff L. Kern of Hebron, Ky., sent in a unique solution. Because his formula contains a deliberate circular reference, it must be recalculated six times by selecting /Worksheet Global Recalculation Iteration and entering *6*. This one-formula, 181-character solution works for values of up to 18 digits in *1-2-3* Release 3.*x* and for values of up to 15 digits in *Symphony* and *1-2-3* Release 2.*x* and earlier.

Cell A1 contains the value, and cell A4 contains the following formula:

```
@IF(@VALUE(A4)<>A1,@STRING
  (A1,0),@IF(@IF(@ISERR
  (@FIND(“,”,A4,0)),
  @LENGTH(A4),@FIND(“,”,
  A4,0))<4,“”&A4,@REPLACE
  (A4,@IF(@ISERR(@FIND
  (“,”,A4,0)),@LENGTH
  (A4),@FIND(“,”,A4,0)))–3,0,“,”)))
```

This material was prepared by Daniel Gasteiger and the Technical Editors, with the help of the Lotus Customer Support staff.

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CIRCLE 120 ON READER SERVICE CARD

More Tips on Using Lotus Products

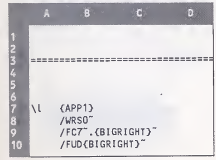
Allways

Uncluttering printouts

Here's a way to avoid cluttered *Allways* printouts. To create double lines to separate the different areas of a *1-2-3* spreadsheet, you can enter \= or \- in one cell and then copy it to the appropriate ranges. However, *Allways* is capable of producing much cleaner underlining with its Format Underline or Format Lines commands. But *Allways* also displays and prints the double lines that appear in *1-2-3*. If you remove the underlines created with *1-2-3*, you lose the helpful visual separation when working on the spreadsheet.

There is a way around this. You can create a macro that uses the *Allways* Format Underline command. It hides *1-2-3*'s staccato double line (in *Allways*) and replaces it with a seamless *Allways* double underline. The macro invokes *Allways*, then sets the row height of the row that contains the underline created in *1-2-3* to zero and the color for that row to white. The macro then formats the same range of cells for a double underline.

To recreate the model, enter \= in cell A3 and copy it to range B3..D3. The line can be extended across the screen, but in our figure it is shorter, to save space. To create the macro, enter the labels as shown, preceding those in cell A7 and range B8..B10 with a label prefix.



```
      A         B          C          D
 1
 2
 3  ================================
 4
 5
 6
 7  \l   {APP1}
 8       /WRSO~
 9       /FC7~.{BIGRIGHT}~
10       /FUD{BIGRIGHT}~
```

With the cell pointer in cell A7, select /Range Name Labels Right and press Return to name the macro. When you start the macro, you must be in *1-2-3* with *Allways* attached, but not invoked. *Allways* must be assigned to APP1 (Alt-F7) for the macro to work. The cell pointer should be in cell A3. Hold down the MACRO key (Alt on most computers) and press L. The macro places a double line across the *Allways* screen from column A to column I, although the figure shows only the double line in range A3..D3. The last line of the macro can be modified to allow a more flexible underline range. To do so, change the label in B10 to */FUD{?}*.

Ronald C. Sheff
Great Neck, N.Y.

Print white on black

You can print white text on a black background by using *Allways* and a Hewlett-Packard HP LaserJet Series II printer. If you format a range of data with solid shading (/Format Shade Solid) and then set the text color to white (/Format Color 7), the range should appear in reverse video on the *Allways* screen. However, if you invoke *Allways* and try to print this range to the LaserJet using the HP LaserJet Series II driver, you will get a solid black block without any visible text. That's because the HP LaserJet Series II driver does not distinguish between different font colors. Every color selection translates to black.

Instead, use the *Allways* HP LaserJet (original model) driver, which sends graphics information to the printer and enables it to achieve the white-on-black effect simply by leaving the text area blank.

If you need to add the HP LaserJet (original model) driver, start the *Allways* Setup Program, AWSETUP, from an A> prompt with the *Allways* Setup Disk in drive A. Follow the prompts to add a printer and exit the setup program. Then load *1-2-3* and attach and invoke *Allways*. Change the driver that is active in *Allways* by selecting /Print Configuration Printer and selecting HP LaserJet (original model). Then select Quit.

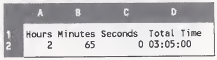
Ann M Marcus
LOTUS staff

Revisited

Calculating swim times

I have an alternative to Steven Burciaga's approach to calculating swim times (July, page 70). My method uses a formula instead of a macro, and you can use it to calculate more than one result at a time.

In the figure, cell D2 contains the formula +A2/24+B2/1440+C2/86400 with the Time 3 format. All you need to do is enter the hours, minutes, and seconds—or any combination of the three—in cells A2, B2, and C2, respectively, and the result appears in cell D2.



```
       A       B        C         D
1  Hours Minutes Seconds  Total Time
2      2      65        0 03:05:00
```

To calculate more than one swim time, copy the formula from cell D2 down column D to as many rows as you have swimmers.

Shane Devenshire
Microtech
San Francisco, Calif.

Where are my footers?

Mary Goodwin wrote to ask why her footers were not printing (January, page 96). You suggested that when printing, she may not be selecting Page (in *Symphony*, Page-Advance) between the Go and Quit commands. This may be true, but I have a different problem when I print footers. If the right margin is off the page, the worksheet may print properly, but a right-justified footer will not.

For example, I have a worksheet that is 40 characters wide. My right margin is set to 132. The body of the worksheet prints properly: It does not matter that the right margin is wider than necessary.

However, my footer is right-justified. An 8½-by-11-inch sheet of paper fits 80 characters per line. Because the right margin is 132 and the footer is right-aligned, the 132nd character wraps one line and prints in the middle of the next.

There are several solutions to this problem. I could reset the right margin to 80 by selecting /Print Printer Options Margins Right (in *Symphony*, SERVICES Print Settings Margins Right) and entering *80*. I could enter a setup string to produce a smaller font size so that 132 characters fit on a line. To do so, I'd select /Print Printer Options Setup (in *Symphony*, SERVICES Print Settings Init-String) and enter the setup string for compressed print. A third solution would be to manually add spaces to the footer so that it appears right-justified. I also could use a left-aligned footer to avoid the problem altogether.

Trent Werner
Rolling Meadows, Ill.

Order-point formula

Here's an improvement of the order-point formula that ran in Good Ideas (May, page 82). It determines how many boxes to order, given the number of units in each box and the total number of units needed.

@INT((A2–1)/B2)+1

This formula is 14 characters less than the original formula. But more importantly, it works faster because it contains fewer @functions and no logical tests.

Scott Bennyhoff
Virginia Beach, Va.

Security in FORM

I have a better formula to prevent changes to records in a *Symphony* FORM window than the one suggested by Ed English (April, page 87).

With this formula you can insert new records in the database in a FORM window, prevent the code from being changed, and use the Validity column to test for invalid entries.

Enter the following formula in cell E12:

@IF(@CELL("type",!B12)=
"b",G12,B12)

When cell B12 (in the Value column) is blank, the formula returns the entry in cell G12 (the Input column). When cell B12 contains an entry, the formula returns that entry.

In a FORM window, if you type over an existing code and press Return, the original code returns. This formula also works with a label field.

Willy Vanhaelen
Leuven, Belgium

CALC as a calculator

The article "1-2-3 Function Keys–A Review" (March, page 42) overlooked a very simple but handy function of the CALC key.

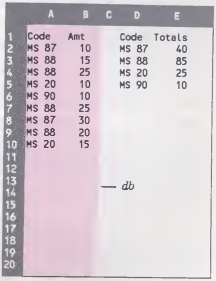
The CALC key allows you to use *1-2-3* (or *Symphony*) as an adding machine. As an example, say a new office expense runs $132 per week. What will this cost on an annual basis? Type *52*132* in the control panel and press the CALC key. The result, 6864, will appear. Now you can press Return to place the result (not the formula) in the worksheet. Or you can press the Escape key twice to clear the control panel and return to Ready mode. You can also enter @functions and cell references and use the CALC key to display the result.

Beverly Schimmel
Skandia America Group
New York, N.Y.

Adding like items

For both *1-2-3* and *Symphony*, I found a way to sum dollar amounts that is faster to enter than the method described in Q&A (April 1989, page 71). My method updates automatically, unlike the one described in "Four Spreadsheet Challenges" (May).

In the figure, range A1..B20 is the database and has the range name *db*. I included 10 blank rows so that the formulas in range E2..E5 update automatically as I make up to 10 additional data entries. Range D1..D5 contains the field name *code* and all the unique codes in the database. It serves as the Criterion range used by the @DSUM formulas to calculate the dollar amounts.



	A	B	C	D	E
1	Code	Amt		Code	Totals
2	MS 87	10		MS 87	40
3	MS 88	15		MS 88	85
4	MS 88	25		MS 20	25
5	MS 20	10		MS 90	10
6	MS 90	10			
7	MS 88	25			
8	MS 87	30			
9	MS 88	20			
10	MS 20	15			
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

Enter the following formula in cell E2 and copy it to range E3..E5:

@DSUM($db,1,$D$1..D2)–
@SUM(E1..E1)

John Keetch
Doraville, Ga.

1-2-3 / Symphony

Freezing @NOW

I use @NOW to produce the current date in my worksheets. If I know I want to print a report at a later time but retain the original date, I create an ASCII file by printing to a file using the Print Printer File command. Later, when I print the file in DOS, the system doesn't recalculate the date.

Robert L. Auerhahn
Eastman Kodak Co.
Rochester, N.Y.

Before you save the file, you could also use the Range Value command to convert the @NOW formula to its equivalent value.

Faster file retrieval

My default directory contains more than 100 WK1 files. If I want to retrieve a file that is in the middle of the alphabetical list, I can spend a long time searching for it with the pointer.

I discovered that I can use the asterisk and question mark for faster file retrieval. For retrieving files, the * and ? wild cards work as they do in DOS. The asterisk represents multiple characters. The question mark represents any single letter or number.

For example, if I know that the file name starts with an N, I select /File Retrieve (in *Symphony*, SERVICES File Retrieve) and enter *n**. The control panel displays all the files that begin with the letter N. If I know that the file name begins with the letters PART followed by three characters, I enter *part???*. The panel displays files named PART101.WK1, PART102.WK1, and so on.

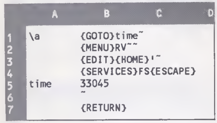
Loren E. Anderson
United Technologies
Dearborn, Mich.

Symphony

Daily File Save

I've developed an application that captures daily stock prices into a *Symphony* worksheet. I needed a way to automate a daily File Save command because I travel frequently and can be away from my office for an extended period. The following macro, which I run as a subroutine of an autoexecuting macro, saves the template file under a new name each day. My staff need only turn my computer on in the morning and turn it off at the end of the day.

Symphony is loaded by a batch file when the system is turned on. The template file and the application macro are both autoexecuting. After *Symphony* is loaded, the template file is automatically retrieved and the macro begins execution. The subroutine is called by the application macro at the end of the day.



```
        A         B            C        D
1  \a        {GOTO}time~
2            {MENU}RV~~
3            {EDIT}{HOME}'~
4            {SERVICES}FS{ESCAPE}
5  time      33045
6            ~
7            {RETURN}
```

The cell named *time* contains the formula @INT(@NOW), which returns the current date in the form of a date serial number. The macro uses the Range Value command to convert the formula into a value and then precedes it with an apostrophe to convert the number into a label. The label then serves as the file name.

Garbis S. Laleian
Sky View Sunroofs Ltd.
Carol Stream, Ill.

1-2-3

Release 3 calculations

While working on a problem in *1-2-3* Release 3, I typed *360/25*. When I pressed Return, the formula disappeared and the value 14.4 appeared in the cell, as well as the control panel. After some experimentation, I found that using parentheses around the numerator, the denominator, or the entire formula retained the formula.

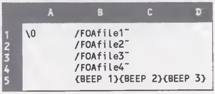
For example, entering *(360)/25, 360/(25),* or *(360/25)* retained the formula in the cell, allowing me to edit the formula in future work sessions. I also discovered that the problem only occurred with division. Addition, subtraction, and multiplication all kept the underlying formula intact.

Ganesh B. Tangella
North Carolina Department of Insurance
Raleigh, N. C.

Automatically loading standard files

I like to work on more than one active file at a time in *1-2-3* Release 3. I developed a macro to read these files into memory in a specified order when I load *1-2-3*.

First I named a file AUTO123, which *1-2-3* retrieves automatically when I load the program. I named my macro \0 within this file. *1-2-3* automatically executes \0 when you retrieve the file that contains this macro.



```
        A         B            C        D
1  \0        /FOAfile1~
2            /FOAfile2~
3            /FOAfile3~
4            /FOAfile4~
5            {BEEP 1}{BEEP 2}{BEEP 3}
```

Range B1..B4 contains the File Open After command, which opens each file and places it after the current one. In other words, file 1 will appear on the screen; behind it will be file 2, and so on. When *1-2-3* finishes loading all the files, the macro beeps three times at three different pitches.

Keep in mind that all the files you want the macro to open must be in the default directory. When you have several files open, you can jump from one to another by holding down the Control key and pressing PageUp or PageDown or, to go to the first or last file, by pressing Control-End Home or Control-End End. Use the Worksheet Window Perspective command to view three files at once. Press the WINDOW key (F6) to jump between windows and the ZOOM key (Alt-F6) to zoom in on one window.

Richard A. Cox
Libertyville, Ill.

90-by-38 window freeze

Because I prefer to view as much of a spreadsheet at once as possible, I use the 90-by-38-screen-display option on my office computer. I also set a horizontal window at the third row from the bottom of the display so that I don't have to press PageDown three times to get to the bottom of the spreadsheet. This way I only need to press PageDown twice to get to the next page.

This doesn't work on my computer at home, which I installed with an 80-by-25 display, because the horizontal window is outside the computer's display range. In fact, it locks the keyboard up, and a series of continually moving vertical bars appear on the screen. To avoid this problem, I clear all windows before I save files that I plan to use on my home computer.

David P. Yon
Tallahassee, Fla.

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Feature Facsimiles

Squeeze more of the power of Release 3.*x* from Release 2.2...for free.

BY E. MICHAEL LUNSFORD

MOTION PICTURE AND TELEVISION PHOTO ARCHIVES

By combining existing functions and features of *1-2-3* Release 2.2, you can simulate some of the distinctive features of Release 3.*x*. This article explores six "work-alike" features: determining the directory of a worksheet file, making an instant graph, assigning a name to print settings, annotating a cell name, annotating a range name, and sorting data on three sort keys. Once you review these, you might begin to devise clever feature simulations of your own.

For several other feature facsimiles, see "The Case of the Borrowed Features" in the September issue.

Determine the directory of the current worksheet file. The @INFO function in Release 3.*x* returns information about your system. You supply one of 11 attribute strings as an argument, and Release 3.*x* returns such information as the amount of available memory, the current number of active files, or the current operating system. One of the most useful is the @INFO("directory") function, which returns the drive and directory of the current worksheet file.

In Release 2.2 three formulas accomplish the same task. To test them, begin in a blank worksheet. Select /File Save and enter a file name. To ensure that you'll be able to see the results of the formulas displayed, you may want to select /Worksheet Global Column-Width and specify a large width—say, 20 or 25. Then in cell A2 enter the formula @CELLPOINTER("filename"). This function returns the current drive, directory, and file name. In cell B2 enter the formula @RIGHT(A2,12). This formula returns the 12 rightmost characters in the label located in cell A2. In cell C2 enter this long formula, which strips all characters except those that identify the drive and directory of the file:

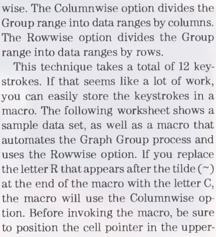
```
@LEFT(A2,@LENGTH(A2)-
(@LENGTH(B2)-
@IF(@ISERR(@FIND("\",B2,5)),
@IF(@ISERR(@FIND("\",B2,4)),
@IF(@ISERR(@FIND("\",B2,2)),
@IF(@ISERR(@FIND("\",B2,0)),0,
@FIND("\",B2,0)+1),
@FIND("\",B2,2)+1),
@FIND("\",B2,4)+1),@FIND("\",B2,5)+1)))
```

You probably won't want to enter a formula this lengthy on a regular basis, but it can be a lifesaver—for example, when a macro needs to determine the directory in which a file resides. If you foresee using these formulas often, save them in a file. When you need them, use the File Combine commands to bring them into the current worksheet.

Make an instant graph. The Quick Graph key (F10) in Release 3.*x* allows you to create an instant graph. In Release 2.2 you can use the Graph Group command to accomplish the same task. Both methods produce the same graph, but the Graph Group command takes more keystrokes than the Quick Graph key.

Before using the Graph Group command, make sure that the X and A-through-F data ranges are in consecutive columns or rows. Then select /Graph Group. Specify the range containing the data to be graphed, then select Columnwise or Rowwise. The Columnwise option divides the Group range into data ranges by columns. The Rowwise option divides the Group range into data ranges by rows.

This technique takes a total of 12 keystrokes. If that seems like a lot of work, you can easily store the keystrokes in a macro. The following worksheet shows a sample data set, as well as a macro that automates the Graph Group process and uses the Rowwise option. If you replace the letter R that appears after the tilde (~) at the end of the macro with the letter C, the macro will use the Columnwise option. Before invoking the macro, be sure to position the cell pointer in the upper-left corner of the Group range—in this case, cell A1. Then press the RUN key (Alt-F3) and select Row from the list that appears in the control panel.



	A	B	C	D	E
1	Paper	Tags	Ribbon	Cards	
2	15	12	17	14	
3	25	11	14	17	
4	19	18	20	12	
5					
6					
7	row	/GRGG.{END}{RIGHT}{END}{DOWN}~RVQ			

Assign a name to print settings. Just as you might assign a name to a set of graph settings, Release 3.*x* allows you to assign a name to a collection of print settings. For example, suppose you routinely generate two reports from one huge worksheet. One report is printed in condensed type with a special header and footer, and the second is printed in standard type with a set of borders. In Release 3.*x*, rather than manually respecifying the settings, you can assign a name to each set. When it's time to print a particular report, just select the appropriate named print settings.

In *1-2-3* Release 2.2 you can use the Learn feature to capture and store special print settings in a macro. Then, when you need to print the report that requires the special settings, you just invoke the macro.

For example, retrieve the worksheet for which you want to create named print settings. Move the cell pointer to a blank area of the worksheet. Select /Worksheet Learn Range and specify a single column range that is longer than you think *1-2-3* will need in order to store the captured keystrokes. Then move the cell pointer to the upper-left corner of the Print range. Press the LEARN key (Alt-F5) to turn on keystroke recording. Select /Print Printer Clear All and then select the desired print settings. After you finish specifying the settings but before you select Align Go, press the LEARN key again to turn off keystroke recording. Then press Quit to get out of the Print menu.

Move the cell pointer to the first cell of the Learn range. To name the macro, select /Range Name Create, enter a name, and specify the first cell of the Learn range. Remember to save the file.

When it's time to print the report, press the RUN key (Alt-F3) and select the macro name, which appears in the control panel. *1-2-3* automatically specifies the customized print settings and then waits for you to select Align and Go.

Annotate a cell. Release 3.*x* allows you to add a note to any formula or value. To do this, type the cell entry followed by a semicolon and the note—for example, @SUM(J4..J14);total units sold.

If you use *1-2-3* Releases 2.01/2.2, you can add a note to a cell entry by typing the cell entry, a plus sign, and the note in quotation marks—for example, @SUM(J4..J14)+"total units sold". Because *1-2-3* assigns a value of zero to text strings, the note doesn't affect the cell's value.

To add a behind-the-scenes note to a label, use an @IF formula with a condition that is always true. Then enter the label as the true result and the note as the false result. For example, if you enter the following formula in any blank cell, only the label *international revenue* appears.

@IF(1,"International Revenue","These numbers are from the annual report."

To read a note, position the cell pointer on the cell. The contents of the cell, including the note, appear in the control panel.

A similar technique embeds a note in macro code. By creating an {IF} command that always returns a false result, you ensure that the macro will never process the line containing the note. Here's an example:

{IF 0}Note: This code manages on-screen prompts.

Preceding the note with *Note:* is not necessary. However, if someone else reads the macro, the addition may clarify the purpose of this line of macro code.

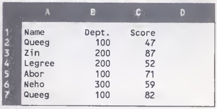
Annotate a range name. The Range Name Note command in Release 3.*x* allows you to attach a descriptive note to any range name. The note might, for example, describe the contents of the named range, list the premises upon which an underlying formula rests, or warn a user not to delete the range name. Then if you select /Range Name Note Table, Release 3.*x* builds a table of range names and their respective addresses and notes.

There is no convenient way to duplicate this feature in other releases. However, you can create a table of range names and then enter a note adjacent to each name. To do this, select /Range Name Table and specify a blank area of the worksheet. An alphabetical listing of named ranges and their respective addresses appears in the worksheet. You can enter a note for each named range in an adjacent column. Be aware that while this technique provides valuable range-name documentation, it doesn't allow for dynamic updating of new or changed range names.

Use three sort keys. As in other releases of *1-2-3,* Release 3.*x* allows you to specify a Primary and Secondary sort key by which *1-2-3* sorts the data records. However, in Release 3.*x* you can also specify up to 253 additional sort keys.

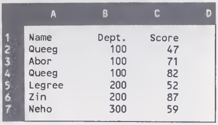
While it's unlikely that you'll ever need to sort on 255 keys, you may occasionally need a third sort key. In *1-2-3* Releases 2.01/2.2 you can simulate a third sort key by performing multiple sorts and using the Data Fill command. Here's how:

Suppose you're working with the following database:



	A	B	C	D
1	Name	Dept.	Score	
2	Queeg	100	47	
3	Zin	200	87	
4	Legree	200	52	
5	Abor	100	71	
6	Neho	300	59	
7	Queeg	100	82	

You want to sort the data records first by name, second by department, and third by score. The first time you sort the database, specify range A2..C7 as the Data range, cell B2 as the Primary-Key, and select Ascending order. Specify cell C2 as the Secondary-Key and select Ascending order. Then select Go. The data records now appear in the following order:



	A	B	C	D
1	Name	Dept.	Score	
2	Queeg	100	47	
3	Abor	100	71	
4	Queeg	100	82	
5	Legree	200	52	
6	Zin	200	87	
7	Neho	300	59	

Now move the cell pointer to cell B1, select /Worksheet Insert Column, and press Return. Select /Data Fill and specify range B2..B7. Enter a start value of 1 and press Return twice to accept the default step and stop values. Sort the database again as follows: Select /Data Sort Primary-Key, specify cell A2, and choose Ascending order. Select Secondary-Key, specify cell B2, and choose Ascending order. Then select Go. The records now appear sorted on three keys, and you can delete column B.

E. Michael Lunsford is the developer of *101 Macros for 1-2-3* (Individual Software Inc.) and author of *Macros, Menus, & Miracles for 1-2-3* (J. Wiley & Sons, 1990).

How Much Is Your Business Worth?

Dealmaker and *Business Valuation Planner* help you put a dollar value on your company.

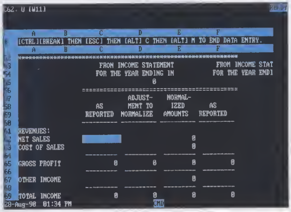
BY JIM KINLAN

Many business consultants may never become involved in high-stakes leveraged buy outs of the *Fortune 500*, but legions of them are responsible for estimating the worth of some 100,000 businesses sold in the United States each year.

Business valuation is an imprecise science at best, these deal makers would concede, but there are ways to impose a method on the madness. *Dealmaker* from ValuSource and *Business Valuation Planner* from Accounting Professionals Software are two tools that help private companies measure their market value, whether for sale or as a means of weighing future opportunities, maximizing estate planning, or initiating an employee stock-ownership plan.

Both of these *1-2-3* spreadsheet templates are best for examining the net worth of private companies with sales between $1 million and $10 million. While the packages offer help in gathering and prioritizing preliminary information such as historical data, they come into their own for processing actual valuations. *Dealmaker* and *Business Valuation Planner* free analysts from having to run complex series of templates by automatically calculating common financial valuations, such as discounted future earnings and adjusted book values. With some of the drudgery taken care of, analysts have more time for analyzing.

Financial consultants who simply want an easy way to calculate valuations may find *Business Valuation Planner* the better value, considering its lower price ($195), substantially easier to use menu interface, and better support for *1-2-3* Release 2.*x*. Those who are looking for a more robust program will be happier with *Dealmaker* ($395), which provides post-sale analysis not found in *Business Valuation Planner*. *Dealmaker* also wins points over *Business Valuation Planner* by offering a wider range of valuation methods, a more comprehensive support program, and a manual that includes a more thorough explanation of financial principles.



```
C62. U [W11]                                                     READY

      A          B          C          D          E          F
[CTRL][BREAK] THEN [ESC] THEN [ALT] C THEN [ALT] M TO END DATA ENTRY.
      A          B          C          D          E          F
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                    FROM INCOME STATEMENT         FROM INCOME STAT
                   FOR THE YEAR ENDING IN        FOR THE YEAR ENDI
                             0
              =========================================
                        ADJUST-    NORMAL-
                 AS     MENT TO     IZED       AS
              REPORTED NORMALIZE  AMOUNTS   REPORTED
              -------- ---------  --------  --------
REVENUES:
NET SALES                               0
COST OF SALES                           0
               -------  --------  --------  --------
GROSS PROFIT         0         0         0         0
               -------  --------  --------  --------
OTHER INCOME                            0
               -------  --------  --------  --------
TOTAL INCOME         0         0         0         0
28-Aug-90  01:34 PM              CMD
```
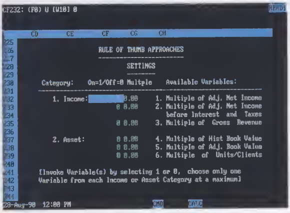

Figure 1. *Business Valuation Planner*'s income-statement data sheet provides separate columns for adjusted and normalized figures. Financial reports frequently are adjusted for tax purposes and may not accurately reflect the company's true financial condition.



```
CF232: (F0) U [W10] 0                                            READY

         CD        CE        CF       CG        CH
                    RULE OF THUMB APPROACHES
                    ------------------------
                           SETTINGS
                           --------
    Category:    On=1/Off=0 Multple    Available Variables:
    ---------------------------------------------------------
       1. Income:          0.00     1. Multiple of Adj. Net Income
                         0 0.00     2. Multiple of Adj. Net Income
                                       before Interest  and  Taxes
                         0 0.00     3. Multiple of  Gross  Revenue

       2. Asset:         0 0.00     4. Multiple of Hist Book Value
                         0 0.00     5. Multiple of Adj. Book Value
                         0 0.00     6. Multiple  of  Units/Clients

    [Invoke Variable(s) by selecting 1 or 0,  choose only one
    Variable from each Income or Asset Category at a maximum]

28-Aug-90  12:00 PM              CMD      CALC
```

Figure 2. In addition to various asset and income valuations, *Dealmaker* offers a "rule of thumb" option that compares sale prices of similar businesses, much as real estate appraisers value houses based on comparable sales in the same area.

These programs aren't just for experts. *1-2-3* users who want to try their hand at the valuation process shouldn't encounter many operational obstacles—as long as they have a sound financial background. Be warned, however, that it's easy for inexperienced users to draw misleading conclusions, even if their data is correct at the outset. Dabblers should solicit the help of accounting professionals before making any deals.

Works like a Consultant

The programs follow procedures that roughly mimic the steps most consultants take in analyzing a target company. After preliminary background research and premises inspection, analysts amass historical data and then subject that data to a series of complex business-valuation calculations. The result is a set of numerical indicators that serves as the basis for analyses and recommendations. While both programs offer valuations based on factors such as liquidation value, book value, or future growth potential, it is still up to the user to determine which is the

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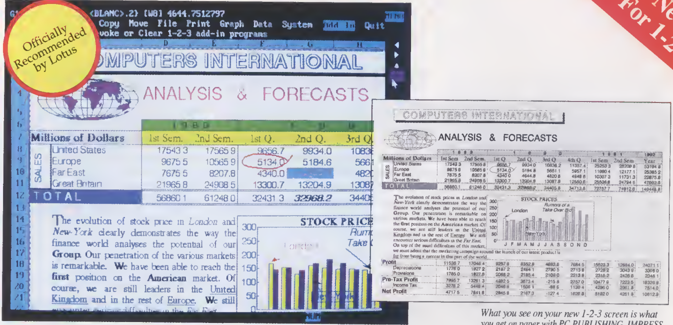

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Millions of Dollars		1st Sem.	2nd Sem.	1st Q.	2nd Q.	3rd Q
SALES	United States	17543 3	17565 9	9656.7	9934.0	1083
	Europe	9675 5	10565 9	5134.0	5184.6	566
	Far East	7675 5	8207.8	4340.0		482
	Great Britain	21965 8	24908 5	13300.7	13204.9	1308
TOTAL		56860 1	61248 0	32431 3	32968.2	3440

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most reliable indicator for the deal at hand.

The first step is to fill in paper forms to organize background information and premises-inspection data, such as the company's history of ownership, the size of its physical plant, and a list of its major suppliers.

Both programs' questionnaires go beyond objective financial-data gathering and encourage the valuator to consider marketing, management, and product issues. While subjective factors such as management skills and competitive advantages can't be calculated, you should nevertheless consider them along with numerical valuations to reach an accurate reading of a company's worth.

Next you enter key numbers on a data-entry sheet. Both *Dealmaker* and *Business Valuation Planner* recommend that you gather and enter up to five years of accounting data, including income statements and balance sheets. Other key entries include the number of existing shares, expected capitalization and interest rates, expected market growth rates, and the actual date of the valuation. The approach to data entry is easy enough that a clerk can complete the forms without much coaching.

Both templates provide an on-screen column where you can adjust financial statements, a crucial consideration if your valuation is to be accurate (figure 1). If your financial reports have been constructed to minimize tax liabilities, you may need to readjust certain numbers, such as interest or contributions, in order to gauge the true financial condition of your company. Neither program, however, offers advice on how to adjust your numbers to achieve an accurate reading.

The Valuations

After the data sheet is complete, the templates subject the data to a series of common asset and income valuations. While these are standard approaches to valuing a business, none is considered to be an absolute indicator of a company's worth. Skilled valuators usually base their recommendations on one specific method and use the other valuation methods as backup, depending on the nature of the company being evaluated.

Available asset valuations include book value, adjusted book value, and liquidation value. Income approaches include capitalization of earnings, capitalization of excess earnings, price-to-earnings multiple, discounted cash flows, discounted future earnings, and a gross-sales multiple.

To those offerings *Dealmaker* adds a market-data approach. This valuation, also known as the rule-of-thumb method, prompts you for details on the recent sales prices of similar businesses and then compares prices (figure 2). The method is much like that used by real estate appraisers who value houses based on similar sales in the same area.

Wrapping Things Up

At each step of the data-entry process, *Business Valuation Planner* prompts you to estimate low, medium, and high values for key assumptions. Accordingly, you receive three sets of valuations for each method calculated.

The software's printing capabilities make output a breeze. *Business Valuation Planner* automatically prints schedules you have selected in condensed mode, so the basic financial report fits neatly on an 8½-by-11-inch page.

Business Valuation Planner lets you produce up to 51 financial-statement ratios and 41 graphs to back up your assumptions. Several graphs are particularly useful because they summarize a great deal of data. One, for example, allows you to show the low, medium, and high valuations produced by each of the eight methods used by the program.

The valuation schedules and graphs, each of which can be printed separately, are meant to be used as attachments to a more complete analysis that you present to your client. *Business Valuation Planner* includes a hard-copy example of a printed report, but because this report is not available as an ASCII file, you have to start from scratch on your word processor to produce it. According to representatives of Accounting Professionals Software, the company is considering including this file in the next release of the program.

Unlike *Business Valuation Planner, Dealmaker* goes beyond the business-appraisal process to provide a wealth of information on how a potential deal might be structured. For example, it suggests kinds of financing that would be required to put the deal together and provides post-sale cash flow statements for the seller and the buyer.

Dealmaker provides a sample client report with accompanying text and valuation schedules. To produce your own report, you need the $195 Report Writer module, which lets you incorporate financial schedules and graphs into a full executive summary. The module contains an ASCII text file that can be imported into a word processor or modified with the program's own text editor. The latter, unfortunately, is saddled with an archaic, *WordStar*-like command structure. Although the ASCII text file is a good example of a report, it's not worth the extra $195. ValuSource would do well to include it as part of *Dealmaker*.

Practical Considerations

Business Valuation Planner comes in both the WKS format of *1-2-3* Release 1A and the WK1 format of Release 2.*x*. The *Dealmaker* 2.0 template is only available as a WKS file, a situation ValuSource promises to remedy with a new release by year's end. The current *Dealmaker*'s WKS format shows its disadvantages in a number of ways: program loading is much slower, and there are certain macro restrictions in Release 1A that *1-2-3* Release 2.0 overcomes.

Both programs feature a macro-driven menu system. *Dealmaker*'s menu system, which is more complex, has several levels of commands that you might find confusing. *1-2-3* users accustomed to typing the first letter of a command might also be troubled by *Dealmaker*, which uses multiple commands beginning with the same letter. This command-line structure forces the user to point to the desired command with the cursor. By contrast, *Business Valuation Planner*'s command structure is compact, concise, and easy to understand and use.

Dealmaker provides a simulated business-valuation tutorial that guides you through a typical business sale. *Dealmaker*'s documentation is considerably more complete and useful than *Business Valuation Planner*'s.

As for support, several *Dealmaker* users contacted for this review praised ValuSource for its knowledgeable and timely help. Direct phone calls to the company corroborated the users' impres-

✓ ✓ ✓

sions that the support staff is better than average.

Business Valuation Planner customers, on the other hand, were less enthusiastic in their critique of Accounting Professionals Software's support. For other than the most basic questions, representatives tell customers to call the template's developer—at another toll number. Neither company maintains a toll-free line for support.

Finally, accountants can earn continuing professional education credits by completing a $35 course from Accounting Professionals Software.

Which template is the better deal for deal making? Especially in light of ValuSource's announcement that a new version of *Dealmaker* will be available by press time, *Dealmaker* edges out its competition, *Business Valuation Planner*, in several key areas, including support, documentation, and post-sale analysis. As soon as version 3.0 corrects the current version's lack of WK1 support, *Dealmaker* clearly will be the program to put your money on. ▪

Jim Kinlan is a PC marketing consultant based in Concord, Mass.

IN BRIEF

Dealmaker Version 2.0. ValuSource, 1939 Grand Ave., San Diego, CA 92109; 800-825-8763. Uses 320K of RAM. Requires DOS 2.0 and any release of *1-2-3*. Requires expanded memory to run with Release 3. $395. 30-day trial period, unlimited warranty against defective media.

Business Valuation Planner Version 1.0. Accounting Professionals Software, 4210 West Vickery Blvd., Fort Worth, TX 76107; 817-738-3122. Uses 134K of RAM. Requires DOS 2.0 and any release of *1-2-3*. $195. 30-day money-back guarantee, 90-day warranty against defective media.

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103	HavenTree Software Limited	15
—	Hewlett-Packard	3, 11
112	Intel Corporation	31
102	Intex Solutions	13
117	Koh-I-Noor Rapidograph Inc	61
—	Lotus Books	27
—	Lotus Development Corporation	6-7, 37, Cover 3
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106	NEC Corporation	19
115	Northgate Computer Systems Inc	50-51
116	Northgate Computer Systems Inc	52-55
124	Pacific Data Products Inc	95
101	Patton & Patton Software Corporation	5
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120	Symantec Corporation	79
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126	American Institute for Computer Sciences	104
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NO.	TITLE	PAGE
1	STAFF LETTER	2
2	IDEAS & TRENDS	8
3	@LOTUS	20
4	START HERE Beyond the Worksheet: File Management	24
5	MACRO LETTERS	28
6	FOR DEVELOPERS Where Am I?	30
7	FEATURE Life in the Fast Lane	40
8	FEATURE Take it to the Limit	45
9	FEATURE The Spirit of *@Factory*	56
10	FEATURE Instant Weekends	63
11	FEATURE Counting the Beans	70
12	Q&A	76
13	GOOD IDEAS	80
14	HELP/2.2 Feature Facsimiles	84
15	REVIEW How Much Is Your Business Worth?	86
16	REVIEW Networks Without Wires	91
17	REVIEW OF REVIEWS Smaller Than a Breadbox	94
18	NEW PRODUCTS	98
19	ESSAY Stop the Review Hype!	106

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43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
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148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168
169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189
190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210

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Article No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1 Excellent	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2 Good	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3 Fair	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4 Poor	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
5 N/A	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

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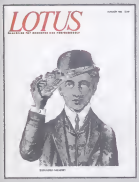

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Networks Without Wires

When the office sneakernet begins to unravel, trade up to radio waves.

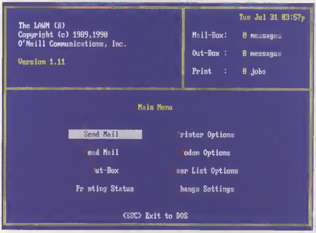
BY MARC DAVIDSON

What's the best way to judge if a new PC product will boost productivity? Ask what you can *make* it do, not what it's supposed to do. If the package is flexible enough to yield solutions to problems the original designers never even considered, you know you've found a gem. In the networking category, O'Neill Communications's LAWN is just that kind of jewel.

Particle physicist Gerry O'Neill, a driving force behind the Geostar Corp.'s satellite-communications system, has worked a bit of magic with radio waves to produce a hardware/software combination that lets you connect computers within a 100-foot range, without cables. Each self-contained unit of the local area wireless network, or LAWN, is essentially a small transmitter/receiver that attaches to the serial port on a computer, printer, or modem; software included with LAWN requires a mere 22K of RAM. That W in LAWN is important: The wireless part means there is no expensive cabling to worry about if you rearrange your office or add new computers.

The system includes electronic mail capabilities, security features, and, as an offshoot of LAWN's spread-spectrum technology, protection against noise interference. At $298 per node, LAWN adds up to a quick, easy, relatively inexpensive way to share printers or modems—and that's merely scratching the surface of its power.

For all its cost-conscious capabilities, however, LAWN isn't a substitute for a full-blown local area network. The 100-foot range of LAWN's 20-milliwatt transmitters requires that networked colleagues remain in close proximity. Also, O'Neill Communications recommends LAWN for no more than 20 users. While that recommended cutoff is not an absolute, a more traditional network, such as one from Novell or 3Com Corp., may be the best bet if you're likely to outgrow the 20-user limitation or need the data-transmission speeds of a cabled network.



```
The LAWN (R)                          Tue Jul 31 03:57p
Copyright (c) 1989,1990
O'Neill Communications, Inc.          Mail-Box:   0 messages

Version 1.11                          Out-Box :   0 messages

                                      Print   :   0 jobs

                         Main Menu

         Send Mail                 Printer Options

         Read Mail                 Modem Options

          Out-Box                  User List Options

      Printing Status              Change Settings

                      <ESC> Exit to DOS
```

Figure 1. LAWN presents a self-explanatory main menu. Printer and modem options designate which printer or modem to use. Direct-connect capabilities are accessed by activating the user-list options.

The best way to appreciate LAWN's capabilities is to compare it to a simple RS-232 A/B switch, commonly used to link two computers to a single printer. LAWN functions the same way, but uses radio waves rather than cables to make its connections.

Basics and Beyond

Version 1.11 of the LAWN software, which I tested on a network of three PCs and two printers, is easy to use. The choices on the program's menus are all reasonably self-explanatory. The main menu, for example, presents options for sending mail, reading mail, or sending files to a printer or modem (figure 1). Also supported are wild card designations, which allow you to tag groups of files for transfer. Although there is no help offered on-screen, menus are straightforward. If you need assistance, the package comes with a highly informative manual.

LAWN's basic capabilities, in fact, are so easy to master that it won't be long before most users begin exploring its flexibility. Given some imagination, you can exploit LAWN's E-mail and direct-connect options to build everything from a one-on-one link between a secretary and a boss to a network serving a work group of 20 people.

The LAWN E-mail software walks you through the process of sending memos or files to individuals or groups. If your assistant regularly updates a worksheet as a weekly report and passes it to you for approval, he or she can use LAWN to send you the file as electronic mail. If you need to distribute that same worksheet to several people in your office every week, you can create and save a distribution list that allows you to send the report to everyone with a single command. You can also create a temporary list on the fly for special needs.

Some of LAWN's most intriguing possibilities grow out of its special direct-connect mode, which lets you temporarily establish a dedicated connection between any two computers or peripherals. PCs linked via LAWN's direct-connect mode can use communications programs as if the two systems were connected by modem or cable. Neither computer can exchange electronic mail with other computers while directly connected.

✓ ✓ ✓

When used in combination with most standard communications programs, the direct-connect feature is a useful alternative to the LAWN E-mail software for file transmission, particularly for users who have large amounts of data to transfer. In my tests LAWN worked with *Procomm Plus* using Ymodem Batch, *CrossTalk* using both Xmodem and *CrossTalk*'s own protocol, and *Carbon Copy* using *Carbon Copy*'s own protocol.

Conventional wisdom dictates that a 19,200-bit-per-second (bps) connection over a LAWN is not going to give you the same transfer times as a 19,200-bps connection over a cable, because the LAWN's own error-correcting features must interact with the various file-transfer protocols of the communications package. And indeed, in my tests this proved to be true (figure 2). For a 50,000-byte file, a *CrossTalk* Xmodem transfer took 32 seconds when the computers were connected by cable, compared to 1 minute and 52.5 seconds when the computers were connected by LAWN.

Not surprisingly, file transfer by the LAWN's own E-mail software was—with only one exception—the fastest choice for file transfer over the LAWN network, clocking in at 41.5 seconds.

Remote Control Options

The direct-connect mode also enables you to exploit remote-operations programs—software that shows the same image on your screen as on a remote computer and lets you enter commands for the host from either keyboard.

If you're the office expert on *1-2-3,* for example, you can now help your colleagues by using LAWN with a remote program, such as *Carbon Copy,* without ever leaving your desk. Also, two people can use *Carbon Copy,* or an equivalent, to work together on a spreadsheet. That way, instead of taking turns at one keyboard, they can use separate computers.

LAWN's 19,200-bps connect speed at the serial port creates a noticeable lag in response time between the host and the remote computer. A test with LAWN, *Carbon Copy,* and *1-2-3* Release 2.2 produced sluggish but tolerable performance. Forget about using this with Release 3.*x*, though; performance is dismal.

Representatives from O'Neill Communications have said the LAWN's direct-connect feature should work with most communications programs, but they acknowledge that there are problems with *LapLink* and some other programs that assume that the computers are physically cabled together. In the tests for this review, *Close-Up,* the remote-operations program, did not work either. O'Neill Communications is looking into the problem.

Transfer Times for a 50K Test File
(rounded to nearest 0.5 second)

PROGRAM	CABLE CONNECTION	LAWN CONNECTION
LAWN E-mail software	N/A	0:41:50
Carbon Copy	0·26:00	0:42:00
CrossTalk Xmodem protocol	0:32·00	1:52.50
CrossTalk XTALK protocol	0:36 00	1:24.00
CrossTalk XTALK protocol w/ 255 block size	N/A	0:33:00
Procomm Ymodem	0:32 50	0:51:0

■ **Figure 2.** In direct-connect mode, only *CrossTalk*'s protocol set at its maximum block size beat out LAWN's own software during file transfer.

Installation Issues

Installing a LAWN unit is simple. LAWN connects to a PC's serial port through a cable, which is supplied. After that, all you need do is put the program disk in a drive, start the installation program, and pick Computer, Printer, or Modem from the menu choices. The program searches your serial ports for LAWN, waits for you to fill in some blanks in an on-screen configuration form, and writes the answers to the LAWN unit. If you are configuring LAWN for a printer or modem, you simply move the unit from the PC to the printer or modem when you're done.

The LAWN transceivers measure 4 inches wide by 7 inches deep by 2 inches high, so they are physically taller than a typical external modem, but they have a smaller footprint.

An on-screen form includes some standard questions relating to such things as monitor type. It also has some LAWN-specific questions, including what name to use for this particular LAWN, which of four channels you want to use (A, B, C, or D), and what security code to assign to the unit (any number from 0 to 65535).

The choice of four channels lets you operate up to four independent LAWN networks in the same office—for different work groups, for example, or for different companies in the same building.

Safety in Bandwidth

You can also use security codes to create independent networks on the same frequency. Establishing two networks on one frequency will not create interference in the sense of garbled transmissions, but it will slow throughput because both networks cannot send information over the same frequency at the same time.

The spread-spectrum technology adopted by O'Neill Communications has an added benefit of making LAWN resistant to noise. In addition to disassembling each bit of data into 16 pieces, or "chips," the system literally spreads out data over a much wider bandwidth than is typical in radio transmission. Because noise tends to peak in very narrow bandwidths, the wide bandwidth makes interference less likely to cause loss of information. Built-in redundancy allows the system to recover data even if some chips are lost. A LAWN network is also unlikely to cause interference, even with another nearby LAWN.

The LAWN channels are all between 902 MHz and 928 MHz, which is assigned for spread-spectrum devices. The unit has an FCC Class B certification, which means it is acceptable for use in residential areas.

If your needs are modest and a 20-user limit doesn't bring on bouts of claustrophobia, LAWN's low price, flexibility, and ease of installation and use offer much to recommend it. ■

Marc Davidson is a free-lance writer and a frequent contributor to *LOTUS*.

IN BRIEF

LAWN Version 1.11. O'Neill Communications, 100 Thanet Circle, Princeton, NJ 08540; 800-624-5296. Requires 22K of RAM. $298 per LAWN unit. 1-year warranty on parts and labor.

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CIRCLE 123 ON READER SERVICE CARD

Smaller Than a Breadbox

A guide to choosing the notebook computer that's right for you

BY TRACY MAYOR

REVIEW *of* REVIEWS

Is there any better fodder for PC publications than "notebook" computers? At a time when most hardware is a commodity, notebooks remain unpredictable. Manufacturers are redefining the market every six to eight months and experimenting with unproven, nonstandard techology in their quest to produce machines that are smaller and faster than their predecessors.

The very nature of notebook computers means trade-offs are necessary: Do you want a powerful but heavy hard disk or a feather-light RAM card? Is an electroluminescent LCD worth the hours of battery life it consumes? Where there's compromise, the PC press reasons, there are readers who need guidance.

Yet the PC publications are every bit as unsettled as the technology being discussed. They have yet to decide which attributes belong on a scorecard used to judge a notebook (screen quality? keyboard ergonomics? storage options?) or the best way to group the machines for comparison (by weight? processor? date of release?). *PC Magazine* sorted by processor; *PC Computing* by weight; *PC Resource*, apparently, by what machines were available for review. *PC User*, a British fortnightly, took the genre to its extreme by running a review of four notebooks focusing almost exclusively on ergonomics.

Organize or Perish

Before you read a single review or talk to a single dealer, develop a working list of what you need in a notebook computer (see the "Setting Your Priorities" box for some guidelines). A list of clear-cut objectives can winnow out half the contestants and give you a clearer gauge of the merits of the other systems.

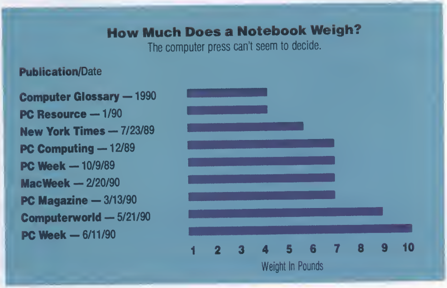
If you're starting from zero, stick with the big, comparative reviews. In addition to covering the spectrum, these reviews provide background about the market as a whole and generally raise your level of knowledge. *PC Week*, *PC Magazine*, *PC Computing*, and *PC Resource* have all run comparative reviews in the last year, but watch for new reviews that cover machines not covered before, such as the Sharp PC-6220, the CompuAdd Companion, and the Texas Instruments TravelMate 2000.

Many comparative reviews approach the length and complexity of *War and Peace*. Take the *Cliffs Notes* approach: Skim for what you need to know and then turn to the tables and benchmarks.

If you've narrowed down your choices and find that you need more-detailed guidance, look at the various head-to-head reviews that take a tougher stance. *InfoWorld* and *PC Magazine* are the best places to start. Unfortunately, one-to-one comparisons tend to be written on a last-in, first-out basis. For example, reviews comparing the Compaq LTE and Compaq LTE/286 with the Toshiba T1000XE and T1200XE abound, but there's nary a Toshiba-versus-NEC UltraLite article to be found. And the Sharp PC-6220, heir apparent to the UltraLite's crown, had garnered only a few substantive reviews by press time.

Scaling Back

With 10 or so notebook comparisons published since the beginning of the year, you'd think someone would be able to tell you what a notebook *is*. Not so. Weight criteria range from the naive "less than 5 pounds" championed by the Computer Language Co.'s *The Computer Glossary* to *PC Week*'s whopping 10-pound limit in a June 11 roundup, an upward revision from a more manageable 7-pound limit used in an earlier set of *PC Week* notebook reviews (see below).



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CIRCLE 124 ON READER SERVICE CARD

The October 1989 advent of the Compaq LTE/286, the first notebook to boast an 80C286 chip, caused some confusion as reviewers wrestled with whether to judge it as a '286 laptop or as a high-end notebook. *PC World* gave it high marks in its March review of '286-based laptops, lauding, among other aspects, the LTE/286's "surprisingly reasonable price." That was odd because publications, such as *PC Week* and *PC Computing,* that compared the LTE/286 to other notebooks listed its original $4,499 price as one of the only drawbacks to a highly recommended machine.

InfoWorld got caught in another bind. A June 18 review rated the Toshiba T1200XE, a '286 machine, against two other '286s and six 8086/8088 notebooks, while a January 1 review rated the Compaq LTE/286 against '286-based laptops. As a result, it's hard to compare the Compaq and Toshiba machines head-to-head. Even so, *InfoWorld*'s rat-a-tat-tat writing and detailed summary boxes make both reviews worth reading.

You can understand classifying a '286 notebook with other '286-based portables, but how about *PC Magazine*'s decision to run a 15-page feature in March on 8086/8088 notebooks—at a time when the Compaq LTE/286 and the Texas Instruments TravelMate LT286 were the only notebooks on the market that were *not* 808*x* machines? That situation has since changed drastically, but the omission led to some strange conclusions. *PC Magazine* bypassed giving an award to the Compaq LTE but alerted readers to the fact that the LTE/286 had won the publication's Editor's Choice award in another category.

PC Magazine was right in line with *PC Computing* and *PC Resource* in its devotion to the NEC UltraLite, long after such praise was appropriate. Nobody denies that the sleek, 4.4-pound wonder defined the standards of notebook computing when it came out in 1988. But some reviewers can't acknowledge that the standard has been supplanted.

In December 1989, *PC Computing* gushed "a thrill to carry and a pleasure to use, the UltraLite is the definition of high-tech luxury." Even so, the magazine warned readers that the UltraLite was "no longer the best in a class of one."

PC Magazine, on the other hand, offered no such caveat. After complaining about everything from the UltraLite's lack of disk drives to its cursor pad, the magazine awarded the machine an Editor's Choice rating.

NEC managed to ignore all the praise long enough to release an updated UltraLite in August. Early reviews indicate that the 20-megabyte, dual-battery UltraLite 286 will put NEC back near the top of the heap.

PC Magazine's benchmarks lend credence to its recommendations, and the review gets high points for thinking of the little guy. The reviewers recommend the $799 Tandy 1100 FD for buyers who don't need it all, and tips its hat to the Toshiba T10006 as "a computer for people to whom the phrase 'under $1,000' means the difference between buying and not buying."

PC Computing's review, the most readable of the bunch, breaks out of the Compaq/Toshiba/NEC straitjacket by summarizing the best of the rest: a pair of hand-held models, a quartet of non-DOS machines, and several notebooks for niche markets. Also helpful is a comprehensive chart that lists specs, pricing, and pros and cons of each notebook reviewed.

PC Resource tried a similar approach, presenting specifications in one table and well-thought-out evaluations in another. But the Toshiba T1000SE, which *PC Computing* managed to review a month earlier, is missing from *PC Resource*'s January review.

If you'd rather just see the facts, the most thorough chart published so far comes, surprisingly, from the May 21 *Computerworld*, which seldom covers

Setting Your Priorities

Notebook buyers who can articulate what they want—and what they don't want—will have the easiest time matching their needs with an appropriate computer.

Weight and Size. If low weight is important to you, look into the NEC UltraLite line or at the Sharp PC-6220, as well as a host of other new machines that weigh less than 5 pounds. You may encounter cramped keyboards, compromised screen sizes, and limited expansion options as a result.

Screen Quality. Bigger is better but heavier. Backlighting improves screen readability dramatically but cuts into battery life. Sidelighting, featured prominently in the Toshiba T1200XE, is even better. If you'll be computing indoors, steer clear of the Tandy 1100 FD, which depends on external lighting for illumination, but be aware that the Zenith MinisPort, which has been praised for its indoor/outdoor flexibility, performs only acceptably in either situation.

Battery Life. Battery power, supplied most commonly by nickel-cadmium packs, adds weight and cost to a notebook, but it is the reason buyers want notebooks in the first place. It provides complete portability. If you want to work on coast-to-coast flights, stick with machines that can go the distance. So far, Compaq has won out over all the competition in the power category.

Storage. The Compaq LTE and LTE/286, the Sharp PC-6220, Toshiba's notebooks, and forthcoming PCs from companies such as CompuAdd and Texas Instruments all use conventional, industry standard 20-megabyte and 40-megabyte hard-disk drives and 3½-inch floppy-disk drives. For most applications, including spreadsheets, a hard disk is more or less *de rigueur*.

Processor. The first round of notebooks were all powered by 8086/8088 processors. But starting with the Compaq LTE/286, the 80C286 is now the cutting edge, even for machines as light as 5 pounds, such as the Sharp PC-6220. This performance comes at a premium, however, so buyers should make sure they really need the additional throughput before making a commitment.

Price. Analysts estimate that portability adds 20% to 30% to the cost of computers, and notebooks raise the stakes even higher. Prices for fully loaded, '286 notebooks can run close to $5,000. You can buy less-sophisticated offerings from Tandy, Panasonic, and Toshiba for less than $1,000, but you'll have to do without a hard disk or great amounts of RAM.

PC products. Though the accompanying article doesn't offer much insight, it's a good primer for the uninitiated.

PC Week's review of four notebooks is similarly objective, although you'll need a doctorate to figure out its complex system of benchmarks and evaluations. The reviewers assign each machine a weighted score that may be helpful for comparisons, and the accompanying rundown of each machine is factual and concise.

Resources

Byte, December 1989
Computer Reseller News, April 23, 1990
Computerworld, May 21, 1990
InfoWorld, January 1, 1990;
March 19, 1990; June 18, 1990
PC Computing, December 1989;
February 1990; June 1990
PC Magazine, March 13, 1990;
March 27, 1990; June 12, 1990
PC Resource, January 1990
PC User, March 14-27, 1990
PC Week, March 5, 1990; June 11, 1990
PC World, March 1990

The Reviews Recommend...

Compaq LTE and LTE/286

You can't open a computer publication without finding superlatives heaped on the Compaq LTE/286. It was either number one or tied for first place in at least eight publications.

Toshiba T1000SE, T1000XE, and T1200XE

Compaq is hardly in a position to rest easy, with Toshiba's T1000SE, T1000XE and T1200XE breathing down its neck. *PC Magazine*, *PC Week*, and *PC Computing* judged the T1000XE and T1200XE to be equal to or only very slightly less desirable than the Compaq LTE and LTE/286.

Sharp PC-6220

This new kid on the block was only beginning to come under scrutiny, but early results indicate it is turning the Toshiba/Compaq battle into a three-way contest. In fact, it beats those machines in some categories, such as weight and display.

Up and Coming

Texas Instruments Inc. upped the ante on its notebook bid with the Travel-Mate 2000, a 4.4-pound, 1¼-inch-thick '286 unit with VGA graphics and a 20-magabyte hard disk.

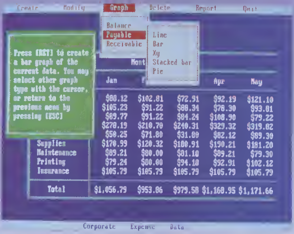
In mid-June CompuAdd Corp. began shipping its '286 Companion, a 4.4-pound, $2,895 notebook with a 20-megabyte hard disk and VGA display.

Tandy Corp. has released the 1500 HD, a 5.9-pound notebook with a 3½-inch floppy-disk drive and a 20-megabyte hard drive for $1,999.

The Compiler for Lotus 1-2-3 v2.2

King Jaguar 2.2 supports **all** Lotus 1-2-3® (1.0A, 2.01, 2.2) macros and fomulas. In addition, the following features make the new King Jaguar the obvious choice when choosing a compiler:

- **Speed** Compiled applications run much faster than they do in 1-2-3.
- **Security** Formulas and macros are protected and concealed from end users.
- **Stand-alone** End users run your applications the same way but do not need 1-2-3
- **EMS & Virtual Memory Support** Run larger than usual applications. If RAM runs out, expanded memory is used, then hard disk space.
- **Customized Look and Feel** Assign colors to each screen element, create pulldown menus, and much more.
- **User Defined Functions** Write your own functions in C or assembly to be used as macros or formulas.
- **Debugger** Watch you macros and formulas execute at a speed you determine.
- **Sideways & Graph Printing** Print reports sideways and graphs from within your application.



```
Press [RET] to create
a bar graph of the
current data. You may
select other graph
type with the cursor,
or return to the
previous menu by
pressing [ESC]
```

```
                Jan                               Apr        May
             $88.12    $102.81     $72.91     $92.19    $121.10
            $105.23     $91.22     $88.34     $78.30     $93.01
             $89.77     $91.22     $84.24    $108.90     $79.22
            $278.19    $210.70    $240.31    $329.32    $319.02
             $58.25     $71.80     $31.80     $82.12     $89.30
Supplies    $170.99    $120.32    $180.91    $190.21    $181.20
Maintenance  $89.21     $80.00     $81.10     $89.21     $79.30
Printing     $79.24     $80.00     $94.10     $92.91    $102.12
Insurance   $105.79    $105.79    $105.79    $105.79    $105.79

Total     $1,056.79    $953.86    $979.58  $1,168.95  $1,171.66
```

King Jaguar 2.2 retails for $595 with a 30-day money back guarantee, and no royalty fees on distributed applications. Call now for more information about **King Jaguar** or **Composa**, the first compiler for Symphony.

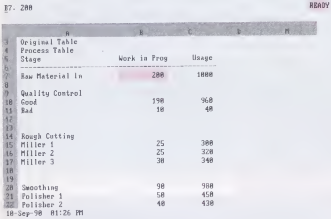
1-800-548-1270 **FAX: 503-641-8822**

Sheng Labs, Inc.

4470 SW Hall Street, Suite 282 • Beaverton, OR 97005

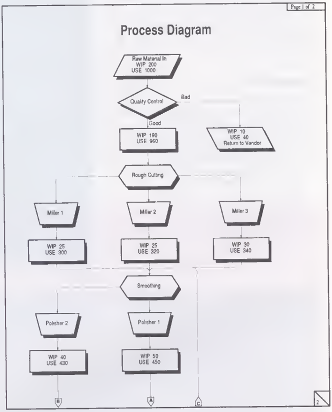
CIRCLE 125 ON READER SERVICE CARD

ALLCLEAR: Create Flowcharts from 1-2-3 Data



```
B7. 200                                                    READY

         A                          B            C         D         M
 3  Original Table
 4  Process Table           .
 5  Stage                    Work in Prog      Usage
 6  ---------------------------------------------------
 7  Raw Material In                   200       1000
 8
 9  Quality Control
10  Good                              190        960
11  Bad                                10         40
12
13
14  Rough Cutting
15  Miller 1                           25        300
16  Miller 2                           25        320
17  Miller 3                           30        340
18
19
20  Smoothing                          90        980
21  Polisher 1                         50        450
22  Polisher 2                         40        430
10-Sep-90  01:26 PM
```



AllClear can produce diagrams directly from *1-2-3* worksheets. In this example, a work-in-progress spreadsheet is converted by *AllClear* into a work-flow diagram. The entire process, from completed worksheet to graphic, takes about 30 seconds.

All during the 1980s the computer industry reaffirmed the old saw that a picture is worth a thousand words by its wholesale turn toward graphical interfaces, applications, and programming techniques.

One company that recognized the trend was Clear Software, a Brookline, Mass., software-development firm that launched its *Clear for dBase* about four years ago, following it with *Clear for C*. The simple purpose of the Clear products was to read, analyze, and produce high-resolution flowcharts of program code. Such a tool allowed programmers to more easily debug their work; managers could more simply track development progress; financial types could see precisely what they were paying for.

Now Clear Software has taken the next logical step in its product line with *allClear*. This multipurpose charting tool uses the same graphing technology as the previous products, but it handles standard text files, outliner files, and even *1-2-3* worksheets to produce procedure charts, tree charts, and decision-tree diagrams in a graphical form that can easily cut through reams of memos, reports, or manuals.

AllClear has inherited many of the characteristics of its progenitors, including an accessible user interface, support for dozens of printers, and high-speed creation of its graphical output. And like the original products, an array of on-screen viewing options lets you carefully examine flowcharts before you print them. For example, you can zoom in and out of the program's chart view to get a detailed look at its contents or toggle among several chart presentation styles to select the most appropriate one. A print preview mode displays output as it will be printed, complete with page breaks, proper element positioning, and (perhaps in jest) graphical representations of pin-feed tearoffs. Zooming works here, too, making it possible to examine multiple pages of the final print job on a single screen.

Unlike *Clear for dBase* and *Clear for C*, *allClear* doesn't understand *dBase* or C programs. Rather, its language abilities are limited to a small programming syn-

ALSO IN THIS SECTION

BUSINESS, FINANCE 101
NETWORKING 101
UTILITIES 101
PROGRAMMING 102
HARDWARE 102
ACCESSORIES 103
TRAINING 103
UPGRADES 103

tax developed by Clear Software in conjunction with software mavens Dan Bricklin (of *VisiCalc* fame) and Adam Green, a *dBase* guru of national repute. Though abbreviated, the language allows *allClear* to build the three distinct chart models mentioned above.

Creating organization charts–one type of tree diagram–will probably be *allClear*'s most popular use. Fortunately, tree diagrams are also the easiest to construct using the *allClear* script language. To create an organization chart, you simply enter names, titles, and other salient information into Aedit (*allClear*'s built-in text editor) or any other ASCII text editor or word processor. Reporting hierarchies are delineated by the order of the names and by *allClear*'s backslash and backslash-end commands. Everything within these two special commands is interpreted as belonging to a new level of the corporate hierarchy.

Procedure diagrams are more complex. Unlike the tree diagram, a procedure diagram illustrates the logical steps required to accomplish a given task. You might, for example, want to create a chart showing the means generally used to solve a common (or uncommon) business problem. Like most problems, these usually entail decision points, checkpoints, and conclusive end points (or, just as often, inconclusive repetition of the same steps with no end in sight). To illustrate such problems, *allClear*'s procedure diagrams allow extensive use of logical commands, such as IF, CASE, LOOP, and GOTO. Some or all of these can be used to diagram the basic steps needed to solve almost any problem.

In order to create these charts, you'll first have to learn the *allClear* script language. Fortunately, there are only 15 commands, and for organization charts you need only 2. Of great assistance is the integral Aedit text editor, which can also be used to construct the text files that structure the charts; its helper mode will automatically build the proper *allClear* language template. From there, you simply place your chart text in the proper spot in the template.

Of course, you don't have to use Aedit, though not doing so will increase the learning curve for the *allClear* language. On the other hand, there's a certain comfort in using a familiar text editor or word processor, and *allClear* can integrate just about any editor directly into its own environment. No matter which editor you choose, you can quickly toggle from your own textual rendering of the chart directly into *allClear's* charting module. On a fast 80386 system, moving from text file to on-screen flowchart takes only a few seconds, so you can move back and forth until the chart looks exactly as you want.

AllClear can also integrate *1-2-3* directly into its own environment, which means that you can create *allClear* templates within a *1-2-3* worksheet and display the resulting text in an *allClear* flowchart. You might want to do this to illustrate what-if scenarios that influence corporate structure ("What if our market share drops to 30%?"), or you might want to figure out how delivery procedures might be influenced by the price of oil. In fact, just about any scenario that is subject to numeric analysis in *1-2-3* is suitable for charting in *allClear*.

The overall method for using *1-2-3* and *allClear* might initially seem rather crude–@functions, named ranges, and text strings must be used to feed information into *allClear*–but the results are impressive. And with a little extra effort, a few sophisticated macros could automate the illustration of some extremely abstract business procedures, such as launching a new product contingent upon the demographic analysis of a particular region of the country. The advantage of the *1-2-3* and *allClear* combination is that these procedures can be analyzed, revised, and illustrated with just a few keystrokes.

–Garry Ray

AllClear. Clear Software. P.O. Box 909, Brookline, MA 02146; 617-621-7190. Requires 512K of RAM, hard disk drive, graphics display, and graphics printer. $299.95. 60-day money-back guarantee.

CIRCLE 1 ON READER SERVICE CARD

1-2-3 for the Poqet:

A Spreadsheet in the Palm of Your Hand

The Poqet PC and 1-2-3 make comfortable traveling companions.

In September 1989 the Poqet Computer Corp. announced The Poqet PC, a one-pound, battery operated, MS-DOS computer that is smaller than a luggable, a portable, a lunchbox, or a laptop–a full-fledged PC that fits in the palm of your hand.

Since its release last year, the Poqet, its peripherals, and third-party software have become available only in fits and starts. This month Poqet began to deliver a long-promised version of *1-2-3* Release 2.2 to complement its current lineup of software from Lotus Development Corp. Other offerings include *Lotus Agenda*, *Lotus Metro/Express*, and the recently acquired *LotusWorks*. All of these have been available for a number of months in Poqet's proprietary Poqet Storage Card format.

The underlying platform is critical to the performance of software such as *1-2-3*. And there's little doubt that the Poqet is a wildly paradoxical system. Its technical excellence is indisputable: The Poqet's small size, long battery life, low weight, and near-perfect PC compatibility are unmatched milestones in personal computing. But these traits also diminish its ultimate usefulness. Even after manufacturing and design improvements, the Poqet's cramped and unresponsive keyboard remains barely acceptable for anything other than occasional use. Furthermore, the supertwist LCD monitor prevents comfortable, long-term viewing.

Still, the overall convenience of the Poqet outweighs many of these limitations. The machine captures the interest of the PC community for some entirely different reasons. The Poqet, like the Mazda Miata, the Sony Walkman, and digital audio tape, has a "gee whiz" appeal that offsets just about all of the objections that can be leveled against it. With a functional version of *1-2-3*, the Poqet now has a bit more going for it.

Like other applications for the Poqet, *1-2-3* is delivered on a small storage module about the size and shape of a credit card. The module is inserted into one of two ports along the side of the computer, from which it is accessed as either drive A or drive B, depending on the slot in which it's installed. The other slot is generally occupied by a Poqet RAM module containing from 32K to 512K of memory and is used as a nonvolatile RAM disk.

Poqet's version of *1-2-3* Release 2.2 is virtually indistinguishable from other versions of the spreadsheet, though its performance is somewhat hindered by the computer. The Poqet is essentially an 8088 IBM PC XT–compatible system with a CGA display. However, its reliance on CGA technology for its LCD monitor, along with a total memory capacity of only 512K, precludes the use of *Allways*. The add-in is thus not delivered with the Poqet Storage Card version of *1-2-3*.

Despite that, standard *1-2-3* graphics can still be created, stored, and printed on the Poqet. The *1-2-3* graphics module (/G) provides unusually crisp onscreen charts even with the computer's CGA resolution. All standard *1-2-3* graphic functions are fully supported by the Poqet version of *1-2-3*. *1-2-3*'s PrintGraph program is also included, and its resolution and functionality are comparable to PrintGraph in other versions of *1-2-3*.

Another new peripheral—a high-density floppy-disk drive—makes The Poqet PC a convincing alternative to notebook computers. Normally, the Poqet is delivered with *PoqetLink*, a program designed to move files from the computer's RAM disks to a desktop PC. *PoqetLink* duplicates the solution provided by Traveling Software's *LapLink*, Rupp Corp.'s *FastLynx*, and other programs. The difference, however, is that Poqet embeds this and other utilities in ROM. It provides a disk version of the program for the desktop PC end of the connection and a connecting cable.

But for those who eschew the cables and complexity of electronic transfer, Poqet is shipping a pint-size 1.44MB floppy-disk drive that, like the computer, runs on AA batteries. This $395 device gives Poqet users an easy way to store data, and moving files to the desktop is as simple as issuing the DOS COPY command.

If you need the type of ultraportable spreadsheet environment offered by the Poqet and its version of *1-2-3*, then look no further. The combination provides the smallest, most reliable, and most convenient spreadsheet platform currently available. But be advised that the pairing also has limitations. The Poqet's display strains eyesight after only a few hours, and the keyboard hinders any demanding spreadsheet work. But as the most portable of portable computers, The Poqet PC has no competition. *—G.R.*

The Poqet PC. Poqet Computer Corp., 650 N. Mary Ave., Sunnyvale, CA 94086; 408-737-8100. 512K of RAM standard. $1,995. 1.44MB floppy-disk drive, $395; 512K memory card, $350; *1-2-3* Release 2.2, $495; *Metro/Express*, $300; *Agenda*, $395; *LotusWorks*, $225.

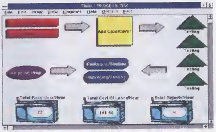
CIRCLE 2 ON READER SERVICE CARD

THINX: A Graphics-Text-Numeric Database

Numbers and images are the theme of *Thinx*, a new *Microsoft Windows*–based graphics product from Thinx Software and Bell Atlantic Corp. of Morgantown, W. Va.

About six months ago the company began touting its program with a mysterious marketing campaign that alluded to the combined power of numbers and images. Descriptions of *Thinx* were elusive, and trial copies of the product became available only recently. Now the mystery is starting to unravel.

Simply put, *Thinx* is a *Windows*-based paint program that includes a database. Images created within the paint module can be linked to database records. Records or reports containing graphics can be printed or displayed on the screen.



Thinx graphics objects are combined with database records. In this way, a graphic image can supply quantitative information.

Creating graphical database records is fairly easy. First, you use the paint program to create graphical objects, as you might in other drawing packages. *Thinx* provides the tools for creating a variety of objects, including circles, rectangles, parabolas, and freehand images. Other tools allow you to alter the line weights, foreground and background colors or patterns, and font sizes and typefaces of text. As in other paint programs, you can use these tools to design your own images, or you can import images through the *Windows* clipboard.

You then create a *Thinx* database table for each unique object in your drawing. Here, too, *Thinx* makes things easy: Simply select the Define Table command from the Data menu and enter any attribute relevant to the object. For example, a chair drawn in *Thinx* might require such attributes as weight, size, fabric, manufacturer, ship date, and price. These attributes are database fields for the chair record.

Once you've created the chair record, the image and its attributes are automatically added to a larger library of graphic objects. At that point, you can select an object from the library and add it to a larger drawing. You can also add graphic objects that have not been previously defined in the database.

Thinx lets you tie formulas to objects. You first create a graphic object and select Define Formula from the Data menu. Then use the tools provided by *Thinx* to create formulas to calculate averages, maximums, minimums, totals, and other functions across one or more of the graphic objects in the drawing, assuming that these objects are defined in the database.

For example, you may use such a formula in an office-design problem to calculate the total cost of a roomful of chairs. Remove one of the chairs and the total cost is adjusted accordingly. Formulas can be applied to a group of objects, to different fields within the same type of object, or even to objects placed in a certain area of the drawing. Thus, you might show the cost of the furniture for each room of the office.

If you've ever wanted to represent a spreadsheet graphically, *Thinx* is worth considering. Though it is no substitute for a spreadsheet, it can import and export *1-2-3* data, which can be attached to graphical objects, possibly providing better insight into a spreadsheet database table. For example, you can import a list of parts into *Thinx* and link it to graphical renderings of the parts. The program also works with *dBase* and *Excel* files.

Thinx is an interesting program that will appeal to those who work with both graphics and numbers. Although it is surpassed in its drawing capabilities by other *Windows* packages, such as *CorelDraw*, and is somewhat rudimentary in its database capabilities, *Thinx* is nonetheless a unique offering for those who need both. *—G.R.*

Thinx Version 1.0. Thinx Software, 9 South High St., Morgantown, WV 26505; 800-388-4465, 800-688-4469. Requires *Microsoft Windows* 3.0, DOS 3.0 or higher, and 640K of RAM. $495.

CIRCLE 3 ON READER SERVICE CARD

BUSINESS, FINANCE

Templates for Commercial Loans

Commercial Loan Spreadsheets is a set of 29 templates for calculating commercial loans. The templates support variable/floating rates, four earnings bases, effective date posting, commitment fees, participations, syndications, bid loans, and nonaccrual/charge-off loans.

Requires *1-2-3* Release 2.*x* or higher. $329.95, from Loan Operations Software, 512 Hillgrove Ave., Western Springs, IL 60558; 312-278-5400.

CIRCLE 4 ON READER SERVICE CARD

NETWORKING

Modular Communication System Links Different Networks

A new modular network communication system combines functions normally associated with network bridges and routers. Called Galaxy Exchange, it supports bridging of baseband and broadband networks, permits the use of broadband backbone networks, supports a variety of coaxial media, and can be configured with up to four network interface modules.

Requires an Ethernet, Token Ring, or wide-area network. $4,995 (interface modules, $395-$4,300), from Zenith Electronics Corp., Zenith Communication Products Div., 1000 Milwaukee Ave., Glenview, IL 60025; 708-391-8000.

CIRCLE 5 ON READER SERVICE CARD

Security System for Novell Networks

CompSec-II-NetOne is a security system for Novell networks. It secures each node individually and then extends the security to the server, including transparent operation, anti-virus protection, and cryptographic management tools. All data and programs are encrypted by the government-approved DES algorithm. The existing Novell operating system does not have to be changed.

Requires DOS 3.1 or higher and a dedicated file server using Novell 2.1 or above. $495, from American Computer Security Industries, 112 Blue Hills Court, Nashville, TN 37214; 615-883-6741. One-year hardware-replacement warranty.

CIRCLE 6 ON READER SERVICE CARD

Utility Uses Network to Track Resources and Employees

Tracking personnel and facilities is the mission of *Time Out!*, a memory-resident program that stores information on a file server. It replaces traditional paper logbooks and pegboard systems by recording information electronically. *Time Out!* also monitors and reports on the availability of company resources, such as vehicles, conference rooms, and equipment.

MARTY BRAUN

Requires DOS 3.0 or higher and a Novell or Net Bios network. Uses 180K of RAM when running. $595 for 10 users, $1,195 for 25 users, $1,695 for 50 users, from Nordra Technologies, P.O. Box 645, Andover, NJ 07821; 201-786-6878.

CIRCLE 7 ON READER SERVICE CARD

UTILITIES

Sales Management Eased with Contact Software

Sales and marketing professionals are the targets of *Maximizer* 2.0, a program that helps users manage information on sales and other business contacts. You can store names and addresses, manage and search contact data, write letters, generate lists of contacts to call using any criteria on file, schedule follow-up calls, and print reports for meetings or billing. The program can be customized to suit individual needs.

Requires DOS 2.1 or higher (DOS 3.1 for the LAN version), 512K of RAM, and a hard disk. $295 (LAN version, $695), from Richmond Technologies and Software, 6400 Roberts St., Suite 420, Burnaby, BC V5G 4C9, Canada; 604-299-2121.

CIRCLE 8 ON READER SERVICE CARD

American Heritage Goes Electronic

The American Heritage Electronic Dictionary is now available. It provides complete definitions and etymologies for more than 116,000 words and phrases. Other features include *Roget's II Electronic Thesaurus*, which provides more than 500,000 synonyms for 42,000 words; a reverse dictionary, wherein a word can be found by its definition; anagrams; and a basic word processor.

Requires DOS 2.1 or higher, 140K of RAM, and a hard disk with 3MB of storage. $89.95, from Houghton Mifflin Co., One Memorial Drive, Cambridge, MA 02142; 800-633-4514. 60-day money-back guarantee.

CIRCLE 9 ON READER SERVICE CARD

PROGRAMMING

Extended Batch-Language and Batch-File Compiler

Sound, box drawings, and passwords can all be included in DOS batch files created with *SonofaBatch*, a batch-file enhancer/compiler. It supports the basic batch commands embedded in MS-DOS and PC-DOS but adds language extensions to provide additional function-ality. Unlike some batch-language extenders, which require an interpreter on computers running enhanced batch files, this program creates COM files that can be run royalty-free on any DOS computer.

Requires DOS 2.1 or higher, 384K of RAM, and one floppy-disk drive. $69.95, from Hyperkinetix Inc., 666 Baker #405, Costa Mesa, CA 92626; 800-873-9993 or 714-668-9234.

CIRCLE 10 ON READER SERVICE CARD

HARDWARE

Share Printers and Modems Without a Network

Multiple users can share printers, plotters, and modems with SL, a peripheral-sharing device that includes a memory buffer and control software with a pop-up menu. Maximum computer memory usage is 25K. Purchasers can choose a unit with four parallel and six serial ports or a new model with eight parallel and two serial ports. The ports can be used for either input to a PC or output to an attached device. Any number of SLs can be linked together, and the buffer can be upgraded from 256K to 4MB.

Requires DOS 2.0 or higher. $495 for 256K buffer, $675 for 1MB buffer, from Buffalo Products, 2805 19th St. SE, Salem, OR 97302-1520; 503-585-3414. 45-day money-back guarantee; one-year limited warranty on parts and labor.

CIRCLE 11 ON READER SERVICE CARD

Color Scanner for Mac and IBM PC

In Epson America's ES-300C flatbed scanner, purchasers get a color scanner with image manipulation/retouching software for less than $2,000. The scanner comes with either IBM PC or Macintosh interface kits and features 24-bit color processing, which provides more than 16 million colors with 300-dpi resolution.

Requires DOS 3.0 or higher and 640K of RAM or a Macintosh SE or later with 1MB of memory (24-bit color card required for full-color viewing). $1,995 (PC interface, $495; Macintosh interface, $595), from Epson America Inc., 23530 Hawthorne Blvd., Torrance, CA 90505; 800-922-8911. One-year limited warranty.

CIRCLE 12 ON READER SERVICE CARD

DAVID GARNER

CD-ROM Drives Get Faster and Cheaper

Improved performance and lower prices are offered by four new 5¼-inch, half-height CD-ROM drives introduced by Sony Corp. Two of the models—the CDU-541 (for internal installation) and the CDU-6211 (for external installation)—feature an embedded SCSI-II (revision 10) controller. The CDU-531 (internal) and CDU-6201 (external) are less-expensive units that use a Sony bus controller and an 8K ring buffer. All provide 25% faster access time than previous models, built-in audio, and improved error correction.

Require DOS 2.1 or higher and 640K of RAM. Pricing on request. From Sony Corp. of America, 655 River Oaks Pkwy., San Jose, CA 95134; 408-432-0190.

CIRCLE 13 ON READER SERVICE CARD

NEC Releases Low-Cost PostScript Printer

The NEC Silentwriter2 Model 90 is a low-cost PostScript laser printer that prints six pages per minute and is compatible with both the Macintosh system and MS-DOS. The unit includes 2MB of RAM, expandable to 4MB, and uses a 16MHz Motorola MC 68000 microprocessor Adobe PostScript interpreter that provides 35 resident scalable typefaces. Thirteen additional fonts are furnished for HP LaserJet Series IIP emulation. Interfaces include Centronics parallel and RS-232 serial ports, plus AppleTalk/RS-422.

Requires a Macintosh system or MS-DOS. $2,495, from NEC Technologies, 1414 Massachusetts Ave., Boxborough, MA 01719; 508-264-8000. One-year warranty on parts and labor (first 90 days on-site).

CIRCLE 14 ON READER SERVICE CARD

Print Bar-Code Labels From Your HP LaserJet

Pacific BarCode and Pacific BarCode PE combine a cartridge for HP LaserJet printers with supporting software so that you can print bar codes and labels. The product lets you design and view labels on-screen in 11 symbologies. Special fonts and graphic routines are included.

Require DOS 2.1 or higher, 512K of RAM, a graphics adapter, and an HP LaserJet Series II printer (for Pacific BarCode) or an HP LaserJet Series IID, IIP, or III printer (for Pacific BarCode PE) with 1MB of additional memory. $499, from Pacific Data Products, 9125 Rehco Rd., San Diego, CA 92121; 619-552-0880. Lifetime warranty.

CIRCLE 15 ON READER SERVICE CARD

Mannesmann Tally Releases High-Speed Dot-Matrix Printers

Mannesmann Tally is shipping two new 24-pin, serial dot-matrix printers: the MT130/24 (narrow-carriage model) and the MT131/24 (wide-carriage model). Both units offer a top speed of 300 characters per second, Epson and IBM graphics compatibility, and an optional sheet feeder. The printers have a workload capacity of 5,000 pages per month and a mean time before failure of 7,800 hours.

Includes an RS-232 serial port (can also be ordered with a Centronics parallel interface). $899 (narrow carriage) or $999 (wide carriage), from Mannesmann Tally, 8301 South 180th St., Kent, WA 98032; 800-843-1347 or 206-251-5524. One-year warranty on parts and labor.

CIRCLE 16 ON READER SERVICE CARD

Tandy Releases Notebook PC

A notebook PC that weighs under six pounds and is equipped with both a high-density 3½-inch floppy-disk drive and a 20MB hard disk is available from Tandy. Designated the Tandy 1500 HD, this portable computer uses a NEC V-20 microprocessor, which has a clock speed of 10 MHz and zero wait-state memory. It provides 640K of RAM, expandable to 1.64MB, and supports LIM-EMS 4.0 expanded memory. A rechargeable battery provides more than three hours of computing time.

Includes MS-DOS 3.3. $1,999, from Tandy Corp., 1800 One Tandy Center, Fort Worth, TX 76102; 817-390-3011.

CIRCLE 17 ON READER SERVICE CARD

Multimedia Gets Compressed

Computer cards for the creation and playback of CD-ROM XA multimedia applications have been introduced by Sony Corp. The PCY-311 ADPCM (for adaptive differential pulse-code modulation) is an audio-encoding card that lets software developers compress digital audio information to provide much longer play than traditional pulse-code modulation—as long as 16 hours. The CDB-X10 is a low-cost CD-ROM XA interface card that can be installed on IBM PC/AT-compatible computers and that supports MS-DOS CD-ROM extensions.

Require DOS 2.1 or higher and 640K of RAM. $2,695 for the PCY-311 and $399 for the CDB-X10 (volume discounts available), from Sony Corp. of America, 655 River Oaks Pkwy., San Jose, CA 95134; 408-432-0190.

CIRCLE 18 ON READER SERVICE CARD

ACCESSORIES

Label Your System

The Label Logic kit provides 144 labels to identify computer ports, cables, drives, expansion slots, and peripherals. The kit includes a reference card, which defines the terms on the labels and provides space for notes on setup, hard-disk partitions, or other system characteristics.

$6.95, from AMT Communications, 2741 Plaza Del Amo #201, Torrance, CA 90503; 213-320-7757. Money-back guarantee.

CIRCLE 19 ON READER SERVICE CARD

TRAINING

Simulation Program Teaches Financial Management

Learning financial management by controlling a fictitious company from startup through maturity is the concept of a new training program called *Financial Learning System*. The program includes a four-part workbook, case studies, exercises, and review questions that are used in conjunction with a computer-based business simulation. The course covers such subjects as reading financial statements, designing corporate goals, and handling cash flow.

Requires DOS 2.0 or higher, 512K of RAM, and two floppy-disk drives. $299.95, from Strategic Management Group, 3624 Market St., University City Science Center, Philadelphia, PA 19104; 800-445-7089; in Pa. 215-387-4000.

CIRCLE 20 ON READER SERVICE CARD

Politics for the Information Age

Teaching information-systems managers how to deal with corporate politics is the goal of *GamePlan* version 3.0, an expert system that simulates the political response of an organization to actions taken by information-systems executives. The user defines the corporate culture of the organization and the program builds a case study based on a hypothetical company with those characteristics. Using playing cards with messages like *Form a steering committee,* the user wins or loses "credibility chips" and thus wins a "promotion" or loses a "job." The lessons in *GamePlan* apply to the management of any kind of technological change.

Requires DOS 2.0 or higher and 512K of RAM. $695, from NDMA Inc., 638 Danbury Rd., Suite D, Ridgefield, CT 06877; 203-431-0029. 30-day replacement warranty for defective material.

CIRCLE 21 ON READER SERVICE CARD

UPGRADES

Faster operation and lower memory requirements are among the enhancements in *dBase IV* version 1.1. The program now uses 450K of RAM, instead of the 516K previously needed, and allows the user to define the percentage of memory allocated to *dBase* overlays versus applications. Other improvements include disk caching, conditional indexing, additions to the *dBase* language, and improved SQL integration.

Requires DOS 2.1 or higher and 640K of RAM. $795 (upgrades free from *dBase IV* version 1.0; developer's edition with royalty-free runtime module, $1,295), from Ashton-Tate Corp., 20101 Hamilton Ave., Torrance, CA 90502-1341; 213-329-8000.

CIRCLE 22 ON READER SERVICE CARD

HAL MAYFORTH

Information for New Products is supplied by the vendors and was up-to-date as of this writing. Since production specifications change frequently, we recommend that you verify this information with a dealer before making a purchase.

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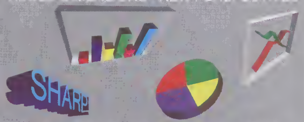

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CIRCLE 135 ON READER SERVICE CARD

Stop the Review Hype!

BY MARK SCAPICCHIO

Choosing the right software and hardware has never been more difficult. Misinformation disguised as real information is everywhere: in advertisements, in catalogs, and in magazine articles placed by ingenious publicists. You hear plenty about new features but nothing about how they are implemented or how they affect compatibility.

MICHAEL THIBODEAU

If software and hardware reviews do nothing else, they should separate fact from fiction. But the reviews I've read recently—including some in *LOTUS*—have clarified less and, in some cases, actually created more confusion. Following are just a few of the problems I've noticed.

Awards. Awards are fine when they are given to the best product in a specific category. But some publications give awards to two or even more products in a category. *PC Magazine*, for example, gave Editor's Choice awards to five of the thirty 80386-based portables tested for its March 13 review. How are consumers to choose between products that all display the same award emblem? If a product doesn't have to be the best in its class to win an award, just what are the criteria? And does giving more awards serve adverisers any better? Ask Dell Computer Corp., which recently used up two expensive advertising pages to explain why its Editor's Choice laptop is better than Toshiba's Editor's Choice laptop. A review should clear up this type of confusion, not contribute to it.

Oranges versus tangerines. Some reviews compare products that are similar but not comparable. Take, for example, the recent spate of GUI word-processor reviews. At this writing, *Microsoft Word for Windows* and *Ami Professional* are the only high-end GUI word processors made for the PC. But *PC World* (May 1990) and *PC Magazine* (July 1990) compared them with "word publishers" such as *DeScribe Word Publisher* and *Legend*, which are primarily desktop publishers with a few basic editing features thrown in for convenience. The result? The word publishers are "found" to lack enhanced editing features, and both *Word for Windows* and *Ami Professional* get a best-of-show award. Are you any better off for having read these reviews?

Sound bites. Claims made in advertisements and brochures are creeping into reviews as facts. For example, you might read that a program is "easier to learn and use because of its graphical user interface." This claim is almost never supported by any evidence, such as an example of a specific task that is easier to learn and perform with this program than with a character-based alternative. The truth is that like any program, a graphical program can suffer from circuitous menus, a bad manual, or scores of nonmnemonic function-key shortcuts—any of which can slow you down like a flat tire. You need specific details to know *how* quickly you can learn a program and *how* easily it can do your work.

User quotes. Many users quoted in reviews are hand picked by the vendor—not all, but enough to strip user quotes of some credibility. Worst among these are quotes from prerelease, or beta, software testers. Take, for example, some of the users quoted in *Personal Computing*'s July 1990 review of *Symphony* Release 2.2. Beta testers have to struggle to be impartial; a tester who criticizes a program is not likely to be asked to test the company's next program. User quotes should be left in the brochures.

Recommendations. Which is better: a review that recommends one product as the best of its type or a review that classifies competing products by special needs? In *LOTUS* I've done it both ways, but I've learned that if a review recommends more than one product from a field of truly comparable products, then the reviewer hasn't taken the comparison as seriously as the consumer has to. Ultimately, you have to choose one product, no matter how much respect you have for the others.

These and other problems stem from a flawed approach. Increasingly, reviews are written like feature articles—full of facts yes, but with few opinions for which the author is held responsible. But a review is not a news story. It should be a detailed justification of an expert's recommendation to buy one product instead of another. It should be a critical evaluation driven by consumer advocacy. Think about the automobile and restaurant reviews you read in newspapers and magazines. No shortage of strong, supported, personal opinions there. And no shortage of editorial courage in printing them. **L**

Mark Scapicchio, an associate product-marketing manager for *Lotus Selects*, previously edited reviews for *LOTUS* magazine.

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